ANNALS

OF

SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE.

VOLUME XIV.

JULY—DECEMBER, 1891.

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ANNALS OF SURGERY.

MALIGNANT TUMORS OF THE NASAL FOSSÆ, WITH FIVE ILLUSTRATIVE CASES.

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THE malignant tumors of the nasal fossæ have received very little attention from the surgeon, and, even by specialists the subject has not been studied with sufficient care. This neglect is probably due to the great rarity of the class of diseases now under consideration. A very few surgical writers of ancient times recognized the existence of malignant disease in the nasal passages, and they described many of the cases as cancer, which, according to our present histological classification, would be placed amongst the sarcomata, Indeed, carcinomatous disease appears to be extremely rare in this region of the body, and the sarcomata are only a little more common.

The five cases now recorded are therefore of some interest, and may form a text for some general observations regarding the diagnosis and treatment of malignant disease of the nasal passages:

The first case is that of a man suffering from an adenocarcinoma, originating in the left inferior turbinated body, causing complete obstruction to nasal respiration, but little or no pain, and only occasional slight hæmorrhages; operation performed 13 months after the onset of the disease, but unsuccessful, on account of the extent of the growth; recurrence within a few weeks, and death three months thereafter.

The second case is that of a man suffering from a myxocar-

cinoma of the right middle turbinated body, which caused
complete occlusion of the right nostril; growth highly vascular,
and bleeds freely on slight injury, but no pain to speak of at
any time. Operation successfully performed 10 months after
onset of the disease. No recurrence within 7 months.

The third case is that of a man who suffered from a round-
celled sarcoma of the middle and superior turbinated bodies
on the left side, associated with severe pain; repeated and
sometimes very profuse hæmorrhages, occasionally checked
by treatment. Removal of growth impossible; great general
prostration; hæmorrhages, anæmia, displacement and protru-
sion of eyeball; somnolence, death from coma, 16 months after
onset of disease.

The fourth case is one of round-celled sarcoma of the left
middle turbinated body. Symptoms at first those of simple
mucous polypus, followed by repeated severe hæmorrhages
with obstruction to nares, and ultimately, by sudden develop-
ment of cerebral symptoms, ending, in a month, by death
from coma, 16 months after apparent onset of the disease.

Case five is that of a middle-aged woman, who suffered
from round-celled sarcoma of the nasal septum, during seven
or eight weeks; sudden formation and rapid growth; complete
obstruction to right nares; occasional pain; hæmorrhage on
injury; deformity of face; complete removal. Cure; no recur-
rence 8 months after operation.

From the above brief summary the general character of the
cases about to be described will be seen, and the more promi-
nent features of the disease are brought into notice. Before
making any further remarks regarding the subject of malig-
nant tumors of the nasal fossæ, it will be well to enquire more
in detail regarding the individual cases.

The following is the history of the five cases which have
been observed.

CASE I. *Adeno-carcinoma of left inferior turbinated body. Com-
plete nasal obstruction. Little pain and slight hæmorrhage. Opera-
tion unsuccessful. Recurrence. Death in three months thereafter.—*
J. M., æt. 47, chrome worker, was admitted into the Glasgow Infirmary
November 16, 1889, complaining of inability to breathe through the

left nostril; and also of a swelling on the left side of the nose exter-
nally. About 20 years ago the septum of his nose became perforated;
this he attributes to the action of the irritating chemical substances
amongst which he works, and he says that many of his fellow work-
men are similarly affected. On examination, a large rounded perfora-
tion is seen in the nasal septum, large enough to allow a shilling to
pass from one nostril to the other. The margins of the perforation
are smooth, completely cicatrized, pale in color and free from ulcera-
tion. The anterior margin of the perforation is situated about half an
inch from the tip of the nose. In the month of May (1889) the pa-
tient began to notice an obstruction in his left nostril, preventing him
from breathing through it, and giving the sensation of the presence of
a foreign body. There was never pain in the nose or elsewhere, but
several times small quantities of blood escaped from the left nostril,
and although not much blood appeared at once, there was a continu-
ous clear or blood-stained watery discharge. On examination the
swelling is seen to be confined to the left side of the nose, and this
growth, the patient states, commenced soon after he felt the nostril
was obstructed, and since then it has gradually increased. He be-
lieves that the swelling has not become any greater during the last
month. At the present time respiration through the right nostril is
free, and nothing abnormal can be seen. The patient has never com-
plained of any pain in the nose, but nearly every night suffers from
frontal headache.

The tumor occupies the anterior half of the left nostril, and almost
touches the septum. It is firmly attached to the inferior turbinated
body by a broad base and has grown so as to cause considerable
swelling of the face, and some displacement of the nasal bones. The
tumor is of a pale, pink color, is irregularly nodulated on its mucous
surface, aud presents somewhat the appearance of coarse œdematous
granulation tissue. When its surface is injured it bleeds freely. A
small portion removed for microscopic examination presented the fol-
lowing structure.

Several sections of the tumor were examined, and they all presented
very much the same structure. The great bulk of the growth was
made up of tubes and cavities lined by cylindrical epithelium. In
some parts the glandular structure was well preserved, and there was a
distinct basement membrane. In other parts large spaces were seen,
which were found to be packed full of irregularly shaped epithelial
cells, but even in these spaces the cells next the stroma preserved to a
considerable degree the cylindrical form.

The whole of the tumor was traversed by a well formed, but not very abundant fibrous stroma ; so small in amount was the fibrous tis-sue, that, in some parts, it was with difficulty detected in unstained sections.   From the microscopic characters of the tumor it was evi-dent that we had to deal with an adeno-carcinoma, or what is called by some writers a cylinder-celled epithelioma, or malignant adenoma.

After examining the sections I assured the patient that little could be done for his relief, and that surgical interference would probably do harm rather than good, unless we could succeed in extirpating the entire tumor.   I also told him that such an operation would be a for-midable one   He determined to return home to consider the matter. In the month of January, 1890, the patient was seen twice, and on his second visit (on the 21st) the tumor was observed to be increased in size, and he was recommended to come into the Hospital immediately, but he did not make his appearance again till March 31. Then he was very anxious to have an operation performed at once,'but I was very reluctant to interfere with a malignant tumor the size and extent of which it was now not possible to determine.

At the operation, the extent to which the tumor spread showed that there was little hope of excising it entirely.   Even although I removed the tumor very freely (as will be shown when the operations for malig-nant disease are described), first with the knife and afterward with Volkmann's spoons, and the thermocautere, still recurrence took place within a few weeks, and the patient died in less than three months thereafter, that is to say, about 16 months after the tumor was first observed by the patient himself, but probably the onset of the disease occurred at a more remote date.

CASE. II.   *Myxo-carcinoma of right middle turbinated body of ten months duration, complete removal with recovery.   No recurrence.*— The patient, J. K., æt. 61, a laborer, was admitted into the Glasgow Royal Infirmary, July 11, 1890, complaining of inability to breathe through the right nostril, which he observed for the first time ten months previously, but at that time the obstruction was attributed to a "cold in the head "   There was little or no pain.   On admission the right nostril is found to be almost completely occluded by a tumor originating from the middle turbinated body.   But while the growth is observed to be in close contact with the septum, that structure is found not to be involved, as a probe can be easily passed between it and the inner surface of the tumor.   The neoplasm is very irregular and nodulated, is highly vascular, and, on the slightest injury, bleeds freely.   A small portion of the tumor was removed for diagnostic pur-

poses, by spoon-shaped forceps, which, when cutting through the growth, showed it to be of a hard brittle consistence; somewhat resembling frosted turnips.

On microscopic examination the tumor was found to be a myxo-carcinoma, and the sections presented the following structure. The great bulk of the tumor displayed the ordinary characteristics of a myxoma, but through small areas the changes about to be described were observed. The surface of the tumor was seen to be covered by squamous stratified epithelium, which, for the most part, was practically normal in appearance, but at several points on the surface of the section the epithelium was noticed to dip down into the deeper tissues, and was no longer limited by a basement membrane, but extended into, and was intimately mixed with, the other cells of the tumor. In some parts of the sections distinct nests, or laminated capsules, were discovered, while, in other portions, the epithelium lining the mucous ducts was found to have proliferated freely.

The character of the tumor being undoubtedly malignant, while it was still small in size, I advised the patient to have the growth removed as soon as possible, and, as I had to leave Glasgow for a few days, I asked my assistant, Dr. D. McKellar Dewar to operate by the same method as I had employed in removing the tumor from J. M. (Case I).

After extirpation, the growth was found to weigh one ounce. The patient made a good recovery, and, when seen last in December, 1890, there was no tendency to recurrence, and the wound had healed so well that the cicatrix was hardly seen unless on very close inspection.

CASE III. *Small round-celled sarcoma of left middle and superior turbinated bodies, repeated ana profuse hæmorrhage, checked occasionally by treatment. Severe pain, displacement and protrusion of eyeball; somnolence, death by coma, 16 months after onset of the disease.*—Mr. M., æt. 64, consulted me on the advice of Dr. Archd. Brown of Mount Florida, in May, 1887. The history given to me at the time by the patient was as follows: About three months ago he began to experience a difficulty in breathing through the left nostril, and at the same time the amount of discharge was noticed to be excessive, and occasionally tinged with blood. Since then, on several occasions, epistaxis has been severe and prolonged. The patient does not complain much of pain, but suffers considerably from interference with nasal respiration, and, when the hæmorrhage is severe, he feels very weak. The discharge also troubles him on account of its quantity and fœtid odor. Examination of the nostrils and posterior nares revealed the presence of a

small soft vascular tumor, growing from the posterior part of the superior turbinated body, together with considerable thickening of the mucous membrane of both nostrils. As the diagnosis in respect to the nature of the tumor was not clear at the time, palliative treatment was employed for the purpose of restraining the hæmorrhage, and if possible reducing the bulk of the mucous membrane, so that a more complete view might be got of the tumor.

During the early summer months (1887) the symptoms ameliorated, and the patient's general health improved somewhat, but, towards the end of August, whilst residing at Rothesay, a very severe attack of epistaxis occurred. So profuse was the hæmorrhage that the anterior and posterior nares required to be plugged, and for some days he was too weak to be removed to Glasgow. Early in September he called to see me; on examination I found that, while the condition of the mucous membrane had improved in appearance, the tumor had increased in bulk, and was even more vascular than formerly. The general condition of the patient was not such as to justify me in recommending a radical operation, even although such a procedure had been considered requisite, but, when it was also known that, from the situation of the tumor, complete removal was impracticable, the question of serious surgical interference was at once set aside. The only operation resorted to was to remove as much as possible of the tumor with the electric ecraseur, for the purpose of temporarily restraining the hæmorrhage. In this the operation was successful for the time being, but hæmorrhage recurred within a few weeks. The portion of the tumor removed was the size of a large walnut, and presented the following appearance: To the naked eye it was of a pale pink color, very soft and pulpy, its surface was irregular and frayed, not unlike the appearance presented by the chorion previous to the formation of a placenta. When hardened for a few days in spirits the growth shrank to about a fourth of its original size, and on microscopic examination exhibited the structure of a small round-celled sarcoma.

The subsequent history of the case was a very sad one. The hæmorrhages became more frequent and profuse, and latterly almost continuous; the patient's appetite gradually failed, and, suffering much from dyspepsia, steadily his strength diminished.

The following observations are taken from a letter I received from Dr. Archd. Brown. "After the last operation the hæmorrhages continued to occur at intervals; but in the course of time the patient began to suffer from other symptoms, due no doubt to the rapid growth of the tumor, severe neuralgic pains troubled him day and night, yield-

ing, only temporarily to powerful sedatives. Obstruction to the lachrymal duct occurred, resulting in abscess. Latterly indications of displacement and protrusion of the eyeball were observed. This condition gradually increased until the patient's expression was totally altered. The general weakness was now very marked, induced partly by bleeding and by pain and sleeplessness. A few days before death the patient became somnolent, but not to any very pronounced degree, except as contrasted with his previous state. The somnolence, however suddenly passed into coma, which, after 24 hours, ended in death on May 20, 1888," about 16 months after the onset of the symptoms.

CASE IV. *Round celled sarcoma of left middle turbinated body. Slow growth of tumor followed by rapid repeated copious hæmorrhages; ultimate involvement of the base of the skull and brain, ending in death from coma.*—The patient, T. W., æt. 46, was sent to me by Dr. William Snodgrass, of Partick, who furnished me with a very complete history of the case. From his report it appears that the patient "noticed in September, 1889, that occasionally fleshy looking masses came from the left nares on blowing his nose, unaccompanied by hæmorrhage to any extent, and not causing much pain. Soon after these masses began to come away regularly about once a week. The patient then consulted Dr. Miller, of Largs, who removed similar fleshy masses, and advised washing the nares with sea water. In February, 1890, had considerable anxiety from business, and other matters. The fleshy masses still continued to come away, and he continued washing the nares as directed by Dr. Miller. Toward the month of November, 1890, he began to experience a 'choky' sensation when eating, and had frequent slight attacks of epistaxis. He also suffered from headaches of a neuralgic kind, which occasionally lasted three or four days, and were sometimes relieved after an epistaxis, but not always. Mr. W. consulted me (Dr. Snodgrass) on Tuesday, December 2, 1890, regarding the above symptoms. The lower turbinated bone on the left side seemed to be enlarged and hyperæmic. I therefore advised the patient to consult Dr. Newman, whom he saw for the first time on Thursday, December 4. He resumed work on the railway next day, and when he was engaged writing, about 9:40 P.M., he noticed that he had made a mistake in addressing a letter. He tore up the paper and wrote the name correctly on a fresh envelope, but this time he made a mistake in the first line of the address. He then tore up the second envelope, and on a third one he wrote the name and first line of address correctly, but made a mistake

in second line of the address. He then stopped work, and walked home about two miles, and he found, on entering the house, that he could not speak to his wife. I (Dr. Snodgrass) saw him about 11 P.M. He was then able to describe the occurrence in a perfectly connected manner. The pupils reacted normally to light. He had no pain in the head, but spoke of flashes of light in the left eye. He remained in bed till Monday, December 8. On that day he went for a short time to work, but on returning to the house he spoke of a feeling of cold in the right arm, leg, and on the same side of the body, although no difference in temperature between the two sides was appreciable by others. On December 25, he rose and felt fairly well, but toward evening his friends noticed that he began to talk incoherently, and I was called to see him. When I arrived I found that he was able to answer questions quite correctly, and seemed generally in a perfect state of consciousness. The pulse was low and regular, about 50 per minute; the pupils small, but re-acting normally and equally to light. The eyelids were slightly œdematous, as were also the cheeks, but there was no other trace of œdema about the body; he experienced no pain. He was somewhat pale, with brownish earthy tinge on face and neck; the breath had an odoı of stale vinegar; there was no excessive thirst nor hunger, but he was weaker than he used to be, although still fairly strong. Urine when examined showed no albumin, but oxalates of lime and a considerable amount of sugar were present. A slight degree of mental wandering was noticeable for several days. Previous to December 29, and on that day, the patient had an attack of epistaxis, in which about two teacupfuls of blood were said to have been lost. This was checked by the application of iced cloths to the forehead and the nose. It returned again, however, on Tuesday, 30, and was again checked by application of ice. It was noticed that he now became somewhat more intelligent. Pulse soft, slightly irregular; tremors of right hand were noticed; but no other sensory or motor disturbance, and he answered questions clearly. The epistaxis returned again on Wednesday, 31. On Thursday, January 1, 1891, the hæmorrhage was checked by use of injection, into nostril, of equal parts of tinct ferri perchlor. and water. On Friday, 2, epistaxis in considerable amount, and marked fœtor from nasal discharge. Pulse soft and irregular, 120 per minute; nares plugged with cotton wool impregnated with iodoform; incontinence of urine, and slight ptosis of right eye. He can open the eyelid about half way, but he cannot tell his right leg from his left; slight hæmorrhage on Saturday, January 3, and Sunday, January 4; incontinence of urine and fæces; considerable tremor in the

right arm; increased ptosis; no complaint of pain. He swallows li-
quids well, but he has had difficulty in swallowing solids, pulse irregu-
lar in force, and frequently, 115 to 125; temperature, 101°. On Mon-
day, 5, only a trace of hæmorrhage from the nostril. The left nostril
was now blocked by the growth; the patient answered most questions
intelligently, and he could move his arms and legs, but the movement
of right eyelid was still deficient; pupils small, but reacting to light;
paresis of both hands; carphologia. He talks incoherently, but lies
perfectly at rest in bed; incontinence of urine and fæces still present.
The fæces were very liquid, and of a dark brownish color; temperature
in the evening, 100 4°; pulse very irregular in force and frequency.
Tuesday morning, temperature, 100 2°, pulse, 120; any attempt to
open the right eye was resisted, but he moved both hands and feet;
marked paresis, with tremor of hands, and signs of nausea when given
food. This passed off during the day. Evening temperature, 101 2°.
Wednesday, January 7, morning pulse, 140; temperature, 100°; respir-
ation, 35; tremors more marked; now his attention cannot be aroused.
Evening pulse too irregular and weak to be counted; temperature,
102.2°; respiration, 40.

"Patient died at 2:15 A M. on Thursday, January 8, in a state of
coma."

When I (Dr. Newman) saw the patient for the first time on Decem-
ber 4, 1890, little could be made out on account of the presence of
blood clot, which, with the swelling, completely blocked the left nos-
tril. After washing the nostril as well as possible, a bleeding point
was seen at the lower extremity of a diffuse swelling, which filled al-
most the entire nares. The surface was smooth and entirely covered,
as far as could be seen, by healthy or slightly hyperæmic mucous mem-
brane, and it looked altogether like a great hypertrophy of the middle
turbinated body. I touched the bleeding point with the electric cau-
tery, and sent the patient home. I did not then suspect the existence
of malignant disease, but at the next visit (December 11), from what
the patient told me, and from the appearance of the growth, which
had now fungated, it was very evident that the disease was sarcoma.

This case illustrates well the difficulty in diagnosis of sarcoma, and
shows how closely it may resemble, even at a late stage of the disease,
simple hypertrophy of the turbinated bodies.

CASE V. *Round celled sarcoma of septum; duration seven or eight
weeks; sudden formation and rapid growth; complete removal with
cure.*—The patient, a woman, æt. 29, was admitted into the Glasgow
Royal Infirmary, March 19, 1890, complaining of obstruction in the

right nostril, accompanied by constant dull aching pain, and slight nasal discharge. The patient stated that she could breathe quite freely through the right nostril, until seven weeks previous to admission, when she suffered from what she believed to be "a cold in the head," but she noticed at the same time that the obstruction was daily becoming greater. On examining her nose, she observed a whitish-looking mass which blocked the nostril, and this growth she said increased in size very quickly, so that on admission, three weeks after, the tumor was first noticed, the right nostril was not only blocked, but the swelling had caused considerable bulging of the external parts. For the last three weeks there was considerable pain occasioned by the pressure of the growth. It was not, however, continuous, but rather intermittent in character. She also suffered from a continuous aching pain in the forehead, which she distinguished distinctly from the pain just referred to. On examination a pale, smooth, firm tumor is observed on the right side of the septum, to which it is attached by a broad base. The growth is in form and size that of a half of a large walnut. The rounded portion presses firmly against the turbinated bodies, and externally there is a good deal of bulging. The examination caused a small quantity of blood to escape, but the patient says that on no other occasion has she noticed the discharge tinged with blood. I was very doubtful respecting the nature of the tumor, and therefore removed a small portion of it for microscopic examination, which showed it to be a round and spindle-celled sarcoma. I, therefore, by reflecting the right side of the nose, exposed the tumor freely, and removed it completely, the base of the growth being subsequently cauterized. Now (February, 1891), the patient is perfectly well, and no evidence of an operation having been performed is seen even on critical examination.

The five cases above recorded illustrate very well some of the varieties of malignant disease of the nasal fossæ, and show, when an operation is resorted to early in the course of the disease, a cure may be effected. Whereas, when the disease is advanced, or of a very malignant type, surgical interference is of little or no avail. A point worthy of note is that malignant and benign neoplasms may often co-exist in the same individual. Voltolini, Hopmann, Schæffer, Terrier and Ricard have recorded instances where the two varieties of tumor have been associated. My fourth case is, no doubt, an exam-

ple of this.   It is necessary to bear in mind that it is not al-
ways right to conclude that because a benign growth has been
removed from the nostrils, and proved to be such by a micro-
scopic examination, that, therefore, other growths occuring in
the same individual are also benign.   In the earlier surgical
writings of this century very little attention was paid to pri-
mary malignant disease of the nasal fossæ, and no clear dis-
tinction was drawn between the two great divisions of malig-
nant neoplasm, the carcinomata and the sarcomata. The
writers, at that time, clearly distinguished, however, a form of
disease in which they considered it inadvisable to operate, on
account of the danger of doing harm rather than good to the
patient.   The earliest recorded case, if we exclude the vague
and unsatisfactory records of antiquity, is one published by
Jonne Babtista Palletta in his "Exercitationes Pathologicæ,
Mediolani," 1820, and another by M. Gerdy in the "Traite des
Polypes," published by him in Paris in 1833.   In the absence
of a microscopic examination of the tumor, it is very difficult
to ascertain their precise nature, as the descriptions given are
equally applicable to different forms of malignant disease.   In
examining the literature of the subject, the bibliography of
which is appended to this paper, these and other cases of a
doubtful nature will be omitted.   The term "cancer" has been
so frequently been used as equivalent to "malignant" that only
by careful inquiry into each case is it possible to form a relia-
ble opinion, many of the published cases of malignant dis-
ease not being histologically carcinomatous although called
so.   Within very recent times, however, a sufficient number
of cases of primary malignant disease of the nasal fossæ have
been recorded to afford us ample material for making an accu-
rate classification, and of drawing general conclusions respect-
ing the symptomatology, diagnosis, prognosis and treatment
of the diseases at present under consideration.   The most
common variety of malignant disease are the round, or the
spindle-celled sarcomata, but while these are the most com-
mon, sarcomata may occur in great variety, and present con-
siderable diversity in their life history and naked eye appear-
ance.   Some, namely, the small round-celled sarcoma, are of
very rapid growth, and are composed of soft, highly vascular

tissue, which on microscopic examination, is found to be com-
posed almost entirely of round-celled embryonic connective
tissue.   Between this type of growth and the hard, firm fibro-
sarcoma there are many gradations, just as is found in tumors
occurring in other parts of the body.   Therefore, it is not al-
ways easy to draw a clear line of distinction between them ;
indeed, in many instances different portions of the same
growth present a remarkable diversity in their histological
structure, the older portions, as a rule, being more fibrous or
more highly developed than the newer parts ; and, when re-
currence occurs, after extirpation of the primary tumor, the
secondary formations are generally of more rapid growth and
lower in type of development than the portions first removed.
From an inquiry into the literature of the subject, it has been
found that the most common malignant disease of the nasal
fossæ are the round, and the round and spindle-celled sarcomata.
We do not here refer to growths originating in the naso-phar-
ynx, or commencing in the bones of the face, and extending
thereafter into the cavities of the nose.   It is only where the
tumors originate in the nasal fossæ.   Of these cases a few ex-
amples of melanotic and pigmented sarcomata have been re-
corded by Heymann, Lincoln and Viennois, while single cases
of myelo-sarcoma, glio-sarcoma and alveolar sarcoma have been
seen by Mason, Weber, and Fowler, respectively.   On look-
ing over the collected cases, it is observed that while these tu-
mors may arise from any part of the nasal fossæ, there are cer-
tain sites selected more frequently than others.   The septum
and upper turbinated bodies are particularly liable to attack.
In the former situation the neoplasm by perforating the carti-
lage, or by involving it in the tumor mass, may extend into
both nostrils. When the growth develops rapidly and is round-
celled in structure, it may be mistaken for an abscess, or a
soft syphilitic growth, and when hard and composed of spin-
dle-celled tissue, it may resemble an enchondroma.

It is stated by Dr. A. F. Plicque, "A polypus inserted on the
septum must, in fact, always be regarded as of malignant na-
ture."[1]   Surely this is not so.   I have removed fibromata and

[1] Annales des Mal du Larynx.   March, 1890.

myxomatous tumors, which were clearly attached to the septum, and where, during the course of the case, no suspicion was raised of malignancy, either by the clinical history, by the microscopic appearance, or by the subsequent course of events.

The round-celled sarcomata are not necessarily of rapid growth. In many instances, as in the cases above recorded, the size of the tumor may increase slowly at first, but in the end, either as a consequence of injury or operative interference, they may soon fill up both nasal fossæ, and extend to the cavity of the skull by invading the ethmoid and sphenoid bones. In a case recorded by Dunlay a tumor existed on both sides of the septum, the cartilage being perforated by the growth. It was soft and fluctuant, of a reddish white color, and fluctuation could be detected by placing a finger in each nostril. The tumor was mistaken for an abscess, and incised, but no pus escaped, and shortly after, the neoplasm invaded the whole cavity of the nose, and the patient died. This, and a few similar cases, illustrates very well the great difficulties attending the diagnosis of soft round-celled sarcomata, not only in the nasal cavity, but in all parts of the body.

The indications of malignancy, namely, rapid growth of the tumor, pain, frequent and copious hæmorrhage, and the appearance of the parts, together with the general constitutional symptoms and aspect of the patient, are not always present. Many eminent surgeons have been led astray by these characteristics being entirely absent. This is most notably observed when benign growths occur side by side with malignant new formations. As a rule, but there are exceptions, malignant growths are sessile, whereas the majority of benign tumors of the nasal fossæ are pedunculated.

When the former class of neoplasms have become diffused, that is to say when they have passed beyond the range of operative interference, the diagnosis is generally easy, and the features of the case only too clearly indicate the probable course of events. In such cases the question: Should a radical and sometimes formidable operation be resorted to, or should we be satisfied by adopting palliative measures? is seldom raised, unless the patient, as in my first case, demands an

operation to be performed, even against the advice of the sur-
geon.

Passing from the sarcomatous tumors, a few remarks may
be made regarding the carcinomata.

Primary carcinomata of the nasal fossæ are seldom met with
in practice, and very few examples have been recorded. Many
of the tumors, designated "cancerous," probably on account
of the symptoms associated with them, have, on more careful
inquiry, proved to be fibromata of the naso-pharynx.   In the
early stage of malignant disease of the nasal fossæ, it is, in
many instances, not only impossible to say whether the tumor
is a carcinoma or a sarcoma, but it is difficult to pronounce the
affection to be malignant or benign. In the first instance the
malignant growth may present the same aspect externally, the
same coloration, consistence, pedunculated form, and give rise
to the same kind of discharge, as an ordinary mucous polypus.
The malignant growths have, as a rule, a greater tendency to
undergo degenerative changes than the benign new formations,
and, not uncommonly, even before the local condition raises
any suspicion as to the nature of the disease, alteration in the
general health may lead one to fear the presence of something
more than a simple polypus.

By far the most common variety of carcinoma met with in
the nasal fossæ is the epithelioma.   Stated roughly it may be
said that two-thirds of these tumors are epitheliomata, while
the majority of the remaining third are adeno-carcinomata.

In any case where the appearance of the tumor raises a
suspicion as to its nature, a careful microscopic examination
should be made of all parts of the growth, *not of one portion
only.*

To distinguish between carcinomata and sarcomata, during
the early stage of the disease, is not always easy without the
removal of the tumor, or a portion of it.   As a rule the sarco-
mata, unless the spindle-celled, give rise to more profuse, and
more often repeated hæmorrhages than the carcinomata.   In-
deed, in cases of the first mentioned disease, the slightest
manipulation may occasion severe bleeding, which is frequently
difficult to stop. Again, I think I may say that during the
early course of the disease, pain is not complained of to the

same extent in cases of cancer as in those of sarcoma.

When once the disease has made much progress, there is unfortunately little doubt as to its nature. Symptoms, such as severe pain, repeated and profuse hæmorrhage, and suppuration may be doubtless the result of such tumors, as the osteomata, fibromata or soft papillomata, but these growths do not increase rapidly in bulk, nor do they ulcerate or give rise to cachexia and involvement of the lymphatic glands, as observed so frequently in malignant disease.

When the nature of the tumor has been ascertained the next question which presents itself is, What is the site of origin of the tumor, and what is its relationship to other parts? It is desirable that these inquiries be answered, if possible, before the surgeon determines what course of treatment should be adopted.

In a few instances, and these only when the patient was under observation during the early course of the disease, the point from which the growth originally sprang has been ascertained; in the great majority of cases recorded, the patient has sought the aid of the surgeon at a time when the tumor had so greatly increased in bulk that the most skillful anterior and posterior rhinoscopic examination failed to reveal the original location or nature of the attachment of the neoplasm.

In such cases it is only after an operation has been performed for the removal of the disease that the relationship of parts is made out. This was so in my first case; in the others the point of origin of the disease was easily ascertained.

When tumors occupy the nares the relationship which they bear to other important structures must be kept in view. For example in my third and fourth cases, the upper parts of the nostrils were involved, in the former the middle and superior turbinated bodies, in the latter the middle turbinated only, as far as could be made out. In both of these instances it was abundantly evident from the history of the case that the growth penetrated the skull and gave rise to the serious cerebral complications, from which the patients died. When the disease involves the upper part of the nares, anything in the way of a radical operation is impossible, and even attempts at partial removal of the disease are contra-indicated, as evil

rather than good is likely to result from such interference, not only by causing a more rapid extension of the tumor, but also by inducing meningitis. When any operation is contemplated upon growths in the situation indicated, it is advisable to pay special attention to cerebral symptoms. The importance of attending to this is well illustrated in my fourth case, where shortly after I first saw the patient, he developed such a train of symptoms pointing to cerebral involvement, viz.: temporary aphasia, inability to write correctly, flashes of light in the left eye, and paresis of right arm and leg, that I not even for a moment contemplated a radical operation.

In the third case it was also evident that any attempt at complete removal of the tumor must only end in failure the question therefore of serious surgical interference was set aside, and the only operation resorted to was removal of very vascular portions of the growth by the electric ecraseur for the purpose of temporarily restraining the hæmorrhage.

In regard to treatment, the cases of malignant disease of the nares may be divided into two classes, (1st), those in which some hope may be entertained of completely removing the diseased parts as in cases 1, 2 and 3, and (2d), those in which operative interference can only do harm.

Even when the disease appears to be limited in extent a preliminary operation for the purpose of gaining free access to the nostrils is necessary. It is not advisable to trust to the simpler but less effectual methods of removal by the snare electric-cautery, loop, or forceps. If anything is to be done it must involve complete removal. Excision of small portions of a tumor may be justifiable for diagnostic purposes, but, when the disease is known to be malignant, other circumstances being favorable, the sooner a radical operation is performed the better. Elsewhere I have drawn attention to the danger of inducing rapid dissemination of cancer by partial removal of the tumor.[1]

It is not necessary for me to describe, or to discuss the respective merits of the numerous methods which have been proposed by different surgeons, as they include all possible

[1]Clinical Society of London Trans., vol. xxii, p. 104.

methods of turning aside the external parts for the purpose of gaining access to the interior of the nares. Indeed in dealing with malignant disease in this region the operator must be guided not so much by what he knows of the case previous to operating as by what he sees during the operation. The performance of a certain operation, as described by another surgeon, may be on the one hand unnecessarily severe, and on the other inadequate, according to the requirements of the individual case.

In cases one and two the same operation was performed. A free incision was made along the naso-genial furrow; the sub-septum, the cartilaginous septum were divided, and the soft parts reflected upwards. The posterior nares were plugged, so as to prevent the passage of blood into the larynx, and in both instances the growths were freely removed by scissors, Volkmann's spoons, chisel and cautery, with the endeavor of carrying the section beyond the diseased and into the healthy parts. In case one, the hæmorrhage was very severe, and even after removal of the turbinated bones and a large part of the left superior maxilla, it was found impossible to get all the disease removed. The cavity, which was of very considerable size, was carefully packed with long strips of iodoform gauze and the ends allowed to protrude from the anterior nares. The hæmorrhage was thus easily checked, and the external parts were brought into their normal position. In the second case, the tumor was limited to the mucous membrane of the middle turbinated body, but notwithstanding this limitation, the growth was removed *en bloc* along with a considerable mass of surrounding healthy tissue, while the base of attachment was cauterized, and the result as has been seen is most satisfactory. No recurrence has taken place within seven months of the operation. Usually, if the tumor is incompletely removed, it reappears within a few weeks at the latest.

The last case recorded (No. 5) required a less formidable operation, on account of the growth being small in size, and situated at the anterior part of the septum. In this instance only the right side of the nose was reflected by making an incision in the right naso-genial furrow, and across the upper lip, a little to the left of the septum. The space given by this

incision was quite sufficient for complete and easy removal of
the tumor, first by scissors and Volkmann's spoon, and after-
ward by the free application of the cautery

One or two observations may now be made regarding the
special dangers attending operations upon the nasal fossæ.
One of the most serious dangers is hæmorrhage, especially
when the tumor is of large size. The passage of blood from
the nares into the larynx and trachea has also led, in a few in-
stances, to bronchial and pulmonary complications, while in-
fective diseases such as septicæmia, erysipelas, and acute men-
ingitis have been responsible for a few deaths.

In endeavoring to check hæmorrhage the surgeon is com-
pelled to employ either tampons, or to plug the nares with
antiseptic dressings. But on account of the offensive dis-
charge, and the septic conditions previous to the operation it
is not possible to keep the exudations sweet for any length of
time.

A method I employed in operating upon a large soft ulcerat-
ing fibroma answered very well. A week previous to the
removal of the tumor in the nose, I performed tracheotomy.
After the patient was anæsthetized a large sponge was placed
in the posterior nares and pharynx so that, while chloroform
was administered by the tracheal tube, no blood passed into
the mouth or trachea. Ollier's operation was then performed,
and the tumor completely removed, after which very profuse
hæmorrhage occurred, but was soon checked by douching the
nares with carbolic solution at 180° F. (1-40 of water). When
the operation was completed, the sponge was removed from
the posterior nares, and a clean one inserted, so as to com-
pletely shut off the nares from the mouth. The tracheal tube
was retained for a week, the patient was fed by means of an
œsophageal tube, and the nares were douched freely three times
a day, with an antiseptic solution. By this means, even al-
though the discharge was most offensive previous to operating,
the wound was kept quite sweet.

The statistics of nasal operations for malignant disease are
far from satisfactory, for in the large majority of instances the
operators have published the cases at too early a date, and
have failed also at a later stage to give the ultimate result.

Of course where the operation has failed to remove the disease entirely, the course of the case can be easily surmised, but in those examples where the surgeon has assured himself that he has excised the whole tumor, surely it is his duty to let the ultimate as well as the immediate result be known.

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MELOPLASTY.

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SOME months ago I extirpated a verrucous cancroid tumor, growing from the mucous membrane of the left cheek, extending forwards close to the angle of the mouth, passing round and behind the teeth, as far as the soft palate and infiltrating in such a way the soft part of the cheek, that the front portion of the tumor adhered to the skin and that, as was shown during the operation, both the masseter and the coronoid process of the lower jaw were diseased. In extirpating cancroid tumors of this size, I have often preferred a secondary plastic operation to a primary one. Certainly, in this case, I had no choice. After having removed the diseased parts of the soft tissues and of the adjacent jaw-bone, it appeared to me, that the probability of a radical cure would be increased by a resolute application of the thermo-cautery to the wound. Once the cauterization done, I had to wait for the cleaning of the wound. After six weeks, however, the aperture had to be reduced. The patient's mouth gaped as far as the left ear, his speech was scarcely intelligible, and a constant discharge of saliva could be observed. My own experience had taught me the difficulties connected with such a plastic operation. I carefully considered how to avoid them, and the gratifying, almost perfect, result attained induced me to study the history of meloplasty. I not only found it very interesting, but it struck me how strikingly the development of surgery is reflected by this particular subject. It is worth while to dwell for a moment on historical details, previous to communicating my mode of operating.

It is unavoidable, for the better understanding of this history, to keep in view, as Velpeau ("Velpeau, Nouveaux Elements de Medecine operatoire." 5me Edition, 1841 et 1842) used to do, two different conditions which necessitate meloplasty. The first condition is met with in that deformity which leaves a great chasm in the cheek and which, communicating or not communicating with the opening of the mouth, is too large to be closed by uniting with sutures the pared edges of the wound. Various modes of operating have been tried to cover such a chasm of the cheek.

According to the Indian method, a flap is loosened and pediculated from the neighborhood of the defect, and this flap ought to fit without too much twisting of its base. In the beginning of our century the French surgeons often followed this method. The neck, as a rule, provided the necessary material: In this way operated Delpech, Lallemand, Dupuytren, J. N. Roux, Gensoul, Ph. Roux; Graefe, 1819, succeeded with the skin of the forehead.

According to the Italian method, a flap is dissected from more distant skin. The extremities yielding the flaps are fixed on the cheek till the skin adheres and the pedicle can be cut. Ph. Roux, 1826, for instance, took the flap from his patient's palm.

In Velpeau's time both methods were disused on account of the mortification of the flaps, and replaced by the French method, *par de collement*, according to which the skin is loosened upward even as far as the orbit and downward even below the margin of the lower jaw. In order to make these flaps join readily without tension, Dieffenbach advised incisions to be made beyond the bases of the flaps, to bridge the chasm in this way. It goes without saying that all these methods were disadvantageous. The defect of the mucous membrane of the cheek remained unremedied and healed by granulation, cicatrization and contraction. In using the French method, after which no fresh skin was interpolated, the disadvantages were felt especially and keenly and only a very careful treatment could prevent the cicatrization of the wound from interfering with the power of chewing. However, in less important cases the result might have satisfied; although Velpeau, finishing his

comments on this subject, says, it will be necessary, should the French method fail, to try again the Indian method, notwithstanding the danger of mortification setting in. Sufficient to show, how uncertain they felt in those days, though in these everything has changed. Antiseptic or aseptic treatment has proved over and over again, that the insufficient circulation of the blood (per se) does not easily bring about mortification, if only those pathogenic cocci keep away which invade and overpower the tissue by taking advantage of its enfeebled condition and imperfect nutrition. It is only natural, that nowadays both methods, as well the Indian as the Italian, are recommended in rivalry. Contrary to what happened years ago, in our days, all methods succeed equally well, though our aspirations grow with our knowledge. In the present we do-not perform meloplasty without adding a plastic operation on the mucous membrane of the cheek, because we want to prevent from the start the effects of cicatrization. In Velpeau's time they looked on the successful adhesion of two inches of skin as on a remarkable piece of luck; at the present time they dissect the skin as far as the breast and the flaps thrive (Israel, Hahn). The upper end of such a flap is fixed, outside in, on the defect of the mucous membrane of the cheek. As soon as it adheres properly, the pedicle is cut and contains material enough to fill the outside defect of the cheek. (*Verhandlungen der Deutschen Gesellschaft f. Chirurgie*, 1887.

Let us go back to the old days and see how they treated that other condition which necessitates meloplasty, that other much more important condition, although there is no chasm of the cheek in this case, and the mouth closes well enough, too well in fact, because cicatricial tissue has produced a firm closure of the jaws, and the patients, in order to avoid starvation, have to rub soft food between the teeth and to suck through the small openings the fluids on which they live. Such patients, wasted and exhausted, begged the surgeon to free them from their sufferings even at the risk of their lives.

It seems that such cases were not at all uncommon. Noma, at present so rare that surgeons of great experience may have never met with it, was common in those days. But the chief reason for the multiplication of those cases existed in the vio-

lent and destructive inflammations of the inside of the mouth,
produced by a too liberal administration of mercury. The
therapeutical action of mercury was not considered beneficial
as long as it did not make an ulcerating inflammation of the
mouth. And mercury was given in several morbid conditions,
in which its use is quite given up now. In such cases the
upper and lower pouch of mucous membrane, either of one or
both sides, were gone. A short, solid and rigid cicatrix kept
the jaws set. It sometimes occurred, that dead pieces of jaw-
bone or loosened molars, involved in the midst of this cicatri-
cial tissue, maintained suppuration and ulceration. A thin,
brownish fluid constantly dribbling from between the pouted
lips, diffused a dreadful perfume. Add to these symptoms an
extreme leanness, and it will be easy to imagine, how the
desire to help could only be surpassed by the stubborness of
the ailment.

And so it is easily understood, that an attempt at help was
made, disregarding the clumsiness of the means.

For the first time, in 1859, Esmarch had pointed out in a
comprehensive way that the pouches of the mucous mem-
brane of the cheek are essential. In the opening of the jaws,
they expand till they vanish, this expansion being necessary
for the flexibility of the inside of the cheek. But it was known
a good many years before that the worst cases of closure of
the jaws are characterized by the absence of these pouches.
When only a rigid band closed the jaws, the cutting, or still
better, the cutting out, of this, sufficiently improved the state
of affairs. But the difficulties set in when the whole inside of
the cheek was one retracted scar. In the bloom of tenoto-
mies, the muscles, masseter and temporal, had to follow suit,
though the latter reacted with vehement bleeding. But at
that time already a more rational treatment had been estab-
lished. According to the French method, the cheek is loos-
ened from the upper and the lower jaw upward and downward,
so that the loose cellular and fatty tissue was widely opened.
This loose tissue could temporarily fulfil the duties of the mu-
cous pouches of the cheek; it was only necessary to prevent
the agglutination of the raw surfaces facing each other. Keep-
ing the jaws constantly opened is of as little use as operating

with wedge, screw-gag, or more complicated instruments. The most ardent zeal could not hinder the old state from slowly and slowly coming back. Was the painful treatment inter- rupted for a few days, the union seemed to be as firm as ever. An obvious experiment to try was whether, perhaps, foreign bodies, placed and fixed in the raw pouches, would lead to a better result. In 1799, Rudtorffer applied lint. Cork and es- pecially small plates of lead were certainly a much better ma- terial, but Velpeau liked the one as little as the other. In 1848 Schuh tried to keep the cheek separated from the jaw with a piece of adhesive plaster, which was put in as a seton, passing, opposite to the fossa canina, through an incision of the upper lip, curving between the cheek and the jaw, leaving the mouth through another incision just before the ramus of the lower jaw. Silver plates, modelled exactly upon the grind- ing sides of the upper and lower jaw, and provided laterally with ascending and descending wings, covering the alveoli of the jaw, and preventing in this way the union of the opposite surfaces, agreed better with the present ideas of treatment of wounds. Christopher Heath, the well known author of "In- juries and Diseases of the Jaws," still praises the salutary ef- fect of this prothesis, which, worn for many months, should re- store original integrity. In June, 1887, this Hunterian profes- sor of surgery and pathology stated in a lecture ("Closure of the Jaws," *Brit. Med. Jour.*, 1887), delivered before the mem- bers of the Royal College of Surgeons of England, that, under the influence of those silver plates, the surface of the wound is covered with a fresh mucous membrane, even at those places where not a trace of mucous membrane remains in the vicinity. According to the results attained, he completely rejects Es- march's opinion that the mucous membrane does not regene- rate, but is always drawn over the wound. As far as I know, Heath is unique in this assertion. But it is perfectly clear that, after excision of a cicatrix, or after "decollement" in trifling cases, such plates may be of great advantage, because the re- maining part of the mucous membrane gets time to be drawn over the wound.

Dieffenbach aimed more directly when he endeavored to provide the wound of the mucous membrane with the same

tissue by transplantation.   Seeing that this idea was not read-
ily taken up, we may safely admit that the difficulties could
not be technically overcome.   Dieffenbach himself tried this
mode of operating, but he always thought, till he died, in
1847, that the bad cases of cicatricial closure of the jaws were
utterly incurable.   And now we see the glimmering of a new
idea through the mist of imperfect endeavors.   Would it not
be practicable to use the skin as a substitute for the lost mu-
cous membrane?

Mutter may be regarded as a pioneer in this new era.   In a
case of closure of the jaws, caused by fibrous bands, which
were situated just behind the commissure of the lips, and
which greatly reduced the aperture of the mouth, a V-shaped
piece of skin, with the apex in the angle of the mouth, was
dissected from the underlying mucous membrane; next the
exposed cicatrix was divided from the outside of the mouth
as far as necessary, and, finally, the V-shaped piece of skin
was turned inside and fixed on the wound of the mucous
membrane.   Thus, in analogy to Roser's operation for phimo-
sis, the wound of the mucous membrane was covered with a
triangular piece of skin and at the same time the commis-
sure of the lips was shifted.   (*Gazette Medicale*, 1837, Decem-
ber 16; cited in *Verneuil's Archives generales de Medicine*,
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Previously, in 1834, Valentine Mott, the American surgeon,
had gone much further in substituting the mucous membrane
by the skin.   Many times it was necessary to divide the com-
missure of the lips and even the cheek, in order to loosen
properly the soft parts from the upper and lower jaw, and, es-
pecially, in order to remove sequestra.   The operation having
been performed, the wound of the cheek was joined by su-
tures.   Mott had the courage not to close the wound.   The
cheek divided as far as the masseter muscle, remained gaping
and both edges of the wound had to heal separately.   In this
manner it was much easier to further and restore the mobility
of the lower jaw. After re-establishment of sufficient mobility,
the time came to reduce the aperture of the mouth.   Vel-
peau, (*loc. cit,*) uses the following words to describe the opera-
tion.

"M. Mott s'est cru forcé dans quelques cas de fendre largement la commissure de lèvres comme Tenon, et de laisser cicatricer isolément chaque bord des plaies pour ne les réunir qu'après avoir assoupli complètement les mouvements des mâchoires. Mais c'est là une operation qui, malgré ce qui en a été dit au nom de M. Mighles (*Gazette Médicale*, 1834, No. 26), et de M. Mott (*Journal des progres*, T. xiii, p. 256), et ce que m'en a écrit récemment son auteur, est encore trop mal connue parmi nous pour que je puisse en donner une appreciation définitive." (T. ii, p. 204).

And further, "Comme M. Mott, j'ai voulu voir une fois si, *fendre* toute la *joue* depuis la commissure jusqu' auprès du muscle masséter, pour disséquer ensuite chacun des bords de l'incision et les laisser cicatriser sèparement, de manière à les recoudre plus tard comme on le fait dans le bec-de-lièvre, réussirait mieux. La joue étant ainsi fendue, ne gêne plus les mouvements de la mâchoire, qu'on peut d'ailleurs assouplir, agrandir par les moyens mécaniques convenables. Une foir, qu'on a obtenu sous co point de vue tout ce vu'on peut désirer, on recoud les bords de la division artificielle. Comme la face interne de chacun des lambeux a eu le temps de se cicatricer, on ne craint plus qu'il se recolle à la face externe des gencives."

I quoted verbally to show better, what I have added myself in the text.

But now the wound in the cheek has grown together with the parts in the mouth, where the mucous membrane was wanting. The outer surface of the alveoli might be totally covered with skin, which when meloplasty is performed, might partly remain and serve as a new mucous membrane. For this purpose it was only necessary to begin the cutting a little distance from the teeth; a coalescence between the alveoli, now covered with skin, and the inside wound of the newly made cheek was then impossible, and the plastic operation on the gum was finished, leaving alone the other question, how to execute the meloplasty. Velpeau applied Mott's mode of operating only once, although he was not very successful, he recomends the method for future attempts. Since that time, however, Mott's method seems to have been forgotten.

The *Dictionnaire Encyclopedique des Sciences Medicales*, 1872, 2me. Series, T. V., p. 409, gives a most comprehensive exposition of our subject, but only the following trifling reference to Mott: Dan le cas de Mott le Chirurgien Américain incisa toute l'épaisseur de la joue et pratiqua la suture aprés avoir fait l'écartement forcé. Esmarch, Victor von Bruns (*Die Chirurgische Pathologie und Therapei des Kau- und Geschmacks-Organs*, 1859), and also Verneuil, quoting Esmarch (*Archives generales de Medecine*, V. Series, TXV., 1860) have

in reference to Mott's method, nothing else to say but that the total division of the cheek may be necessary in order to cut the cicatrices sufficiently. Heath, mentioning Mott, does not say a word in addition to the above quotations, either in his monograph of more than 500 pages, 1868, or in his lectures.

(All these authors refer to Mott's first publication in the *American Journal of Medical Sciences*, Nov., 1829. Velpeau refers to later publications). Pèan, who republished in 1876 Nélaton's handbook on our subject, deals with various forgotten methods, but not with Mott's. O. Weber, the writers on Diseases of the Face in Pitha and Billroth's Handbuch 1866-1873, makes it worse by saying:

Zur Spaltung der Wange, die noch von Einigen empfohlen wird, ist gar keine Veranlassung, da die äussere Haut, wenn sie nicht in den Vernarbungsprozess hineingezogen ist, kein Hinderniss abgiebt. Wo aber die Haut mit der Narbe selbst verwachsen ist, muss die Trennung der inneren Adhäsion mit einer plastischen Operation zur Herstellung eines normalen Mundwinkels U. S. W. benützt werden.

Yet, it was not only Mott who invented this way of operating.

In "Gunther's Lehre von den blutigen Operationen (Heft III Operationen an den Lippen und Wangen, 1866, p. 109). Blasius makes much the same proposition, only he is still more radical. In the same way as Mott, Blasius suggests the division of the cheek and the attachment of both edges of the wound separately to the upper and lower jaw. After the union, however, he cuts the cheek more distantly from the teeth, so far, indeed, that flaps can be made from the exaggerated gums, which flaps dissected from the jaws, turned over and united to each other by sutures, may form the inside of the cheek. The outside of the cheek may be obtained par décollement.

Jaesche, afterward, reinvented Mott's method, applied it with fair success, and has published his case. (*Med. Zeitung Russlands*, 1858, s. 27, cited in Jaesche's later communication). Jaesche's method since its publication has been reported in a most inadequate way, for instance. by Esmarch, (*loc. cit.*) who, dealing with Dieffenbach's transplantations of mucous membrane adds : "Au lieu de muqueuse un lambeau cutané."

I believe Jaesche's communication would have been completely forgotten, as well as Mott's method and Blasius' propo-

sition, had not Jaesche reopened the question in 1868 by describing a second case, operated in the same way with the same success. (*Langenbeck's Archiv* Bd. ix., 1868, s. 526.

After having been spoken of as "Jæsche's method" by Gussenbauer, in his paper on "Meloplasty" (*Langenbeck's Archiv* Bd. xx, s. 526) it obtained, together with Gussenbauer's method, a standing place in the modern literature of our subject. After the above exposition it must be clear that, if one likes to give a special name to this method, it must be called after Mott. Yet, how would it look, if every plastic operation performed somewhere and somehow had to be named? Every plastic operation has its own peculiarities and in this way every surgeon would have a right to be entitled to eternization. An operation deserves the honor of a distinct name if it is typic, if it is not a matter of course, and if it produces special results. Thus tested, the method has to be called after Mott. If the division of the cheek and the subsequent separate union of both edges of the wound are looked upon as the characteristic part of the method, leaving the mode of forming the cheek, to circumstances, then, certainly this way of reconstructing the gum is typical enough to receive a special name. "Granted," somebody may say, "but this division of the cheek is too simple to deserve that honor; it is quickly executed and it requires no skill whatever." True, but it is far from easy to resolve upon such a mutilation. History has taught us that only a few surgeons, and these only after having experienced the uselessness of various other methods, have come to this simple division of the cheek.

But this operation, is it really so advantageous? Why is it constantly forgotten, and why is it necessary, after half a century of its existence, to plead for its rights?

To explain this, another short historical digression may be allowed. I have exposed the difficulties connected with simple meloplasty at the time of Velpeau and Dieffenbach; I have set forth how the success of Italian and Indian methods was always imperiled by the danger of mortification, and how, therefore, though procuring less skin, the French method became a thing of necessity. Well, Mott's method could not be received with general approbation, since the final stage of me-

loplasty was too difficult at that time. That was the weak part, which buried it in oblivion every time, and rightly so.

That it has still to be brought to daylight, while everywhere else antiseptic treatment has revolutionized surgery, is due to the introduction of Esmarch-Rizzoli's method. That method of operating improves so much the cases of cicatricial closure of the jaws, that till this day it enjoys a general approval. But a more critical comparison will show at once that at present there is no reason for its dominant position. Esmarch Rizzoli's method, invented by Esmarch in 1854, applied by Wilms in 1858, and independently invented and performed in 1857 by Rizzoli, leaves the contracted cheek alone, but restores the mobility of the healthy part of the lower jaw by making a new joint before the cicatrix. This operation is tolerably simple, it will answer the purpose if well executed, and it is not dangerous in our days. But the functional restoration of the healthy half of the jaws is the highest purpose intended. Even this cannot be attained, as the movable part of the lower jaw is inadequately supported by the joint and for this reason the jaw will turn to the median line, by which turning the teeth, if they still touch, are pressed against each other obliquely and with little power during the act of chewing. The faculty of taking food may be normal, the faculty of masticating food is not normal at all.

Functionally, as well as cosmetically, there is a great something to wish for. And, as marasmus may be produced by the loss of teeth, it is not safe to think lightly of the privation of one side, and an important functional deficiency of the other side of the jaws.

Without a doubt, Mott's method is preferable, if results are compared. It gives a jaw provided with normal articulations and with muscles at both sides. What can be saved, is restored to use. And if the teeth miss at one side, prothetic dentistry may furnish the means of relief. At the present time it is obvious that, technically, Mott's method is not only an infallible way of procuring gum, but also of procuring mucous membrane in the hindmost parts of the mouth. If necessary the end of the incision of the cheek is enlarged in two directions, so that a V-shaped wedge of skin is formed, which

is turned outside in between the upper and lower jaws, gets its apex close to the soft palate, being fixed here by sutures. No rule can be laid down for procuring the farther material for meloplasty. *Variis modis bene fit.* The Italian method is practically omnipotent, Keetley exchanged by transplantation a big nævus pilosus of the cheek of a child, three months old, with a piece of integument from the upper arm, reaching from near the shoulder to near the elbow. As a pedicled flap, the birthmark was united by sutures to the wound of the arm, the skin of the arm united to the wound of the cheek, and after eleven days both pedicles were cut and the transplants adjusted. (*Lancet*, February 19, 1887.) In Billroth's Klinik it is demonstrated that a flap may wander from the back to the upper arm and from the upper arm to the face. (*Langenbeck's Archiv*, xxxvii S. 91). Rotter passed a flap from the arm through a fissure in front of the masseter muscle into the mouth and saw it take. (*Munchener Med. Wochenschrift*, 1889, No. 30-32; related also in the ANNALS OF SURGERY, April, 1890.) The Indian method does not lag behind. It appeared to Gersuny that a pedicle, merely composed of loose cellular tissue, was sufficient to keep till the definite union a flap alive, which passing an incision above the jaw was spread on the inside of the cheek. (*Centralblatt f. Chirurgie*, 1887, s. 706.) Moreover, the practicability of using a wandering flap exists here as well. As early as 1877, Gussenbauer tried it in his rightly famous case of meloplasty. A flap backward pedicled, was loosened; the cheek was divided; the front part of the flap was turned inside round the masseter and fixed by sutures to the hindmost part of the wound of the mucous membrane. Afterward the pedicle was cut, brought inside and forward, and fixed close to the commissure of the lips. In this way the integument of the cheek was turned outside in two turns and the outside wound was covered with a flap from the neck. (*Langenbeck's Archiv* xxi, s. 526.

The method of Israel and Hahn, mentioned before, intends the same but more simply. Besides this, both methods, as well Italian as Indian, will be still more simple, if combined with Thiersch's skin-grafting. In that case one flap will do of

which the raw surface is covered with small pieces of epider-
mal skin, either before or after the transplantation.   Enough
to show how far the sphere of meloplasty is extended in har-
mony with the sphere of plastic operations generally, and even
beyond the dreams of our predecessors.   This is due to anti-
septic surgery.   But it may be that an aseptic course will
never be a dead certainty.   For this reason, I venture to com-
municate a method of meloplasty of which the results may be
expected with still more confidence, as the nutrition of the flap
is perfect.
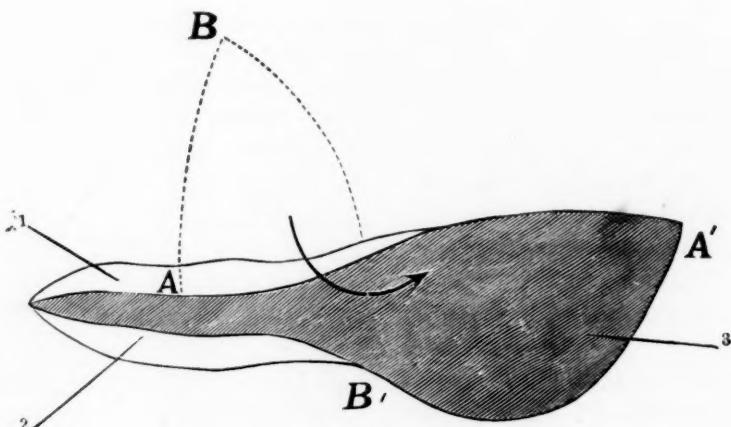
FIG. 1.—DIAGRAM SHOWING CONSTRUCTION OF FLAPS.
1.—Upper Lip. 2.—Lower Lip 3.—Chasm. A, A′ and B, B′, points approximated.

M. Bloks, æt. 45, about a year ago perceived an affection of the in-
side of the left cheek, and for a few months has felt radiating pain in
the left part of the face, in the neck and in the occiput.   There exists
an ulcus papillomatosus covering the whole inside of the left cheek
from close to the angle of the mouth as far back as the soft palate
and at a few places extending on the gum.   In pressing this ulcerated
tumor, numerous small white bodies come in sight, which microscopically
appeared to be polymorphous epithelial cells.   The front part of the
tumor is slightly attached to the skin.   The glands are swollen behind
the angle of the lower jaw.   On January 27, 1890, extirpation of swol-
len glands was performed, the submaxillary gland included.   Then ex-
tirpation of the tumor.   For this, the cheek is divided from the com .

missure of the lips to an inch in front of the tragus ; the attached skin
is widely removed, a good deal of the masseter muscle is sacrificed, the
second and third molars of the lower jaw are extracted, the hind por-
tion of the tumor is removed together with a rather large piece of bone.
Afterward the Pacquelin's thermo-cautery is applied for a long time,
especially to the lower jaw and to the masseter and pterygoid muscles.
In the front part of the wound the skin and mucous membrane are
united by sutures
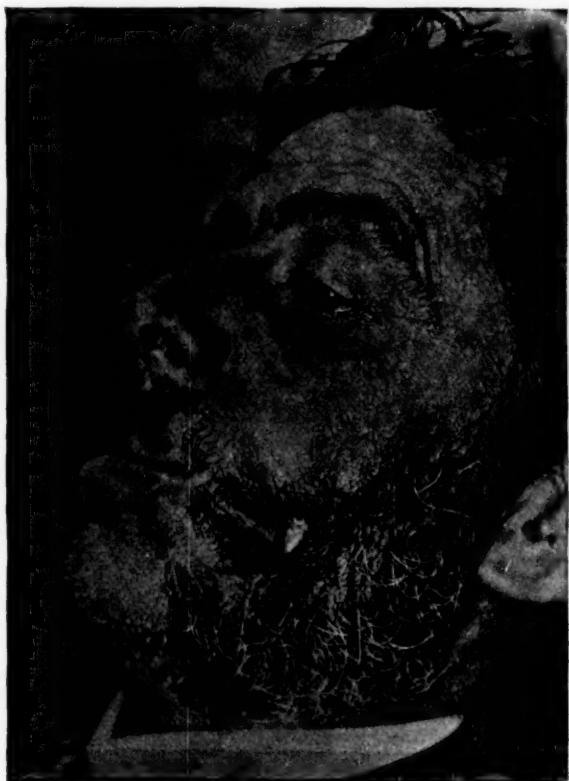
FIG. 2.—FINAL RESULT OF PLASTIC OPERATION ON CHEEK.

March 5, a return in the form of a papillomatous wart of the fissure
of the cheek, is widely extirpated, and the following plastic operation is
executed in imitation of Estlander's method of cheiloplasty, which mode

of operating I have followed a few times very successfully: I constructed a triangular flap from the upper lip and the adjacent part of the cheek. The peduncle, however, being only vermillion border but containing the arteria coronaria, remained outside. Turned in the direction of the arrow, the point A was secured by sutures to the point A′, the point B to the point B′ and the rest according to fitness. See Fig. 1.
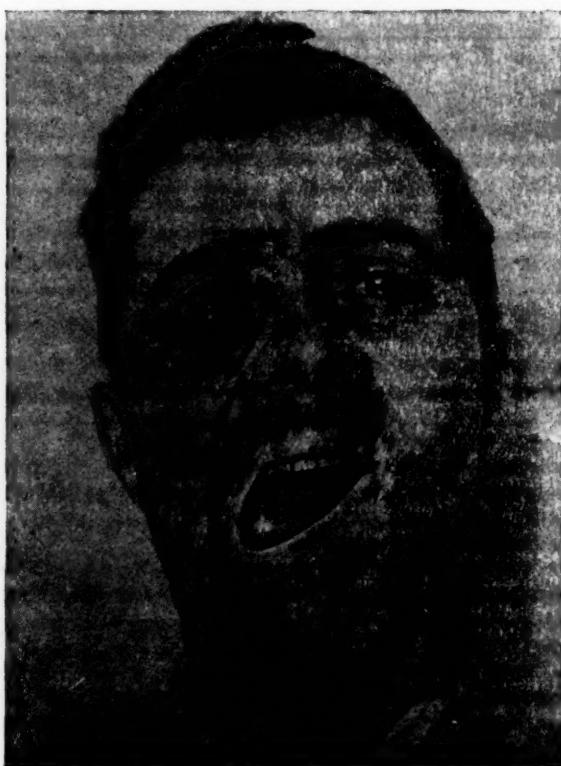
FIG. 3.—SHOWING THE EXTENT TO WHICH THE MOUTH CAN BE OPENED.

After eight days the sutures were removed. Healing by first intention. March 22, patient left the hospital with a small fistula above the transplanted vermillion border

August 26. No return either local or lymphatic. Maximum sepa-

ration of the incisors $^9/_{10}$ of an inch. The patient would like to open the mouth more widely and to have healed up the fistula, in which food is caught now and then. Behind the fistula there is a rigid cicatrix, parallel to what was formerly the anterior margin of the masseter.

This cicatricial tissue is divided. The wound in the inside of the cheek is covered with the vermillion border from the margin of the fistula and over this, after paring, the skin is joined by sutures. September 23. No return. The fistula is closed.

A few hairs originally belonging to the median portion of the moustache are visible in the back of the cicatrix of the mucous membrane. When the jaw is set, the transplanted flap, which is very flexible, measures in length $1^1/_2$ inch, in breadth $^3/_4$ of an inch. The measures in inside are about equal and the marks scarcely visible. The maximum distance of the incisors is now fully an inch. (See Fig. 3.) The normal distance ought to be about $1^1/_2$ inch. In the beginning of October this distance is increased to $1^1/_{10}$ inch. From a cosmetical standpoint the oblique aperture of the mouth, when opened, is the only thing which does not look very well. February, 1891, *idem*, no return.

For a due appreciation of the result obtained, it may be remembered that E. Kuester, in 1885, cleft the cheek, divided the lower jaw with a saw behind the juncture of the masseter, exarticulated the exposed carcinomatous tumor. In this way he treated two cases, which according to the description were not worse than mine. One of the patients died from pneumonia and mediastinitis suppurativa posterior. The other healed, recovered nicely; but Kuester adds:

"Die Nahrungs-Aufnahme war wenig gehindert obleich die Zaehne der beiden Diefer nicht genau auf einander possten. Die Möglichkeit den Mund zu oeffnen, ging bis fast normalen Grenzen." (*Deutsche med. Wochenschrift* 1885, No. 50, cited in *Centralblatt f Chirurgie*, 1886, s. 311).

ON OMENTAL TUMORS DUE TO ADHESIVE INFLAMMATION.[1]

By B. E. HADRA, M.D.,

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MY INTENTION is to speak on a certain class of omental tumors, which though not unknown, are not sufficiently estimated in differential diagnosis. They may be of a more or less spurious character, yet they clinically offer all the features of real tumors. My subject is thus not the tubercular or the malignant new-growth, but the tumor-like conglomeration and the purely cicatrical tumor-like thickening of the omentum, the results of inflammatory processes.

In my opinion the purpose of the omentum is not only to serve as a protective padding to the abdominal cavity against undue forces from without ; but it has a much more important office, that is the protection of the peritoneal cavity against infection from a diseased point within. The slightest irritation anywhere on the peritoneal surface, parietal or visceral, causes the omentum to attach itself over the affected area, if accessible, and in this way to shut off the focus of infection from the remainder of the peritoneal cavity. Thus omental adhesions will be found whenever the surface of liver, stomach, gall-bladder, etc., becomes affected, or whenever virulent material enters through the Fallopian tubes, but obviously affections of the bowel-walls will offer the most frequent and direct occasion. And it is not at all necessary that there should be macroscopic changes, ulcers, abrasions, perforations, etc.; it will suffice that the bowel-wall be so altered as to allow pathogenic germs or their derivatives to penetrate or to percolate through them. As is well known, also in abdominal operations, the

[1]Read before the Galveston Medical Club.

slightest traumatism or the least infection will cause omental adhesions. Senn's omental grafting offers sufficient proof of the ease with which omentum attaches itself to serous surfaces, and all who have had the opportunity of reopening the abdomen after laparotomy have made the same discovery. Omental adhesions are nearly always found, as happened to me in five cases.

Now, after such adhesions are established, it only depends upon their size and compactness whether they will offer to the examiner the clinical features of a tumor or not. Most likely the irritation of the omental structures will not be limited to the close neighborhood of the focus of infection ; the inflammatory process will probably extend into more distant portions, and the consequence will be that folds which are further away will adhere together and thus increase the size of the tumor.

Thus we will have a swelling of an acute origin which ought to be placed on the list of abdominal tumors for differential diagnosis.

Speaking of the symptoms and characteristic features of the omental tumor, I would first mention the presence or the close precedence of some inflammatory affection, situated some where in the abdominal cavity, especially of the alimentary canal. Next is the sudden appearance of the tumor. I do not know of any other swelling which could form with such rapidity. The best example of this tumor which is well known is typhlitis and perityphlitis. It has found other explanations. Some consider it a coprostasis in the cæcum ; others an œdematous infiltration of the pericæcal areolar tissue. I will not deny that such may be the case, but, in my opinion, in most instances we have to deal with omental tumors.[1] It is not easily understood how a mass of scybala may so suddenly be thrown into the cæcum, nor how it so rapidly disappears even without a passage from the bowels. Besides, the swelling is often exceedingly painful to the touch, more so than a simple accumu-

[1] Since this paper was read, I find in a report of the "Transactions of the Medical Society of Berlin," that A. Frænkel has given an explanation of the tumor of perityphlitis identical with my own.

lation of fæces would let us believe.   And then the doughy,
pulpy consistency does not correspond with that of hard
scybala.   Finally, such tumors are not always situated over
the cæcum.   They appear anywhere in the abdomen.   The
appendical area is a favorite locality, because at this point in-
flammation so frequently occurs.   Also some of the omental
fringes which seem to be more inclined to attachments than
the median portion, terminate there.

Against the assumption that œdematous swelling of the are-
olar tissue around the cæcum causes the tumor, may be urged
the indented contour of the more or less well defined borders,
whilst an œdema would present rather a rounded surface with
illy defined limitations.   Also, the superficial location in front
speaks against it, because the bulk of areolar tissue is situated
more to the outside and behind the cæeum.   Besides, the rel-
ative hardness and the absence of pitting forbid the assump-
tion of a mere infiltration.   Still, I would not be so positive
in my assertion, had I not twice had the opportunity of satis-
fying myself on the operation table that the perityphlitic tu-
mor was nothing but adherent omentum, and I know that
others have had a similar experience.   The omental cake is,
as said, not necessarily situated over the cæcum or appendix.
In a case where after the abdominal operation a slight
peritonitis followed, I met it right over the right flexura coli.
It was as large as a saucer, slightly movable, painful and of
pulpy consistency.   It disappeared in a short time under warm
cataplasms.   In another instance I found it, in consultation
with Dr. George Sykes, in a female patient, who was suffering
from a fully developed peritonitis from appendicitis, in the left
side, far away from the seat of the primary trouble.   It had
suddenly appeared, was very painful on touch, and was taken
by us for an encapsulated mass of pus.   We were only pre-
vented from performing a laparotomy by the lateness of the
hour.   Next day all the tumor was gone. Patient eventually re-
covered.   What could this tumor have been, but omen-
tal folds which suddenly became adherent but so lightly as to
free themselves during the peristaltic motions.   I would re-
mind you of a somewhat similar process when an omental
hernia is set free by operation.   There a large mass of omen-

tal folds, held together and to the surrounding structures by adhesive threads, is suddenly liberated and, if replaced into the abdomen, at once unfurls itself and disappears.

In investigating the further fate of the acute omental tumor, we find the following possible outcomes:

1. The inflammation may subside, resorption of all abnormal products set in, and the omentum may detach itself. The tumor disappears.

2. The inflammation subsides, but the omental adhesions become firm and organized. The tumor becomes chronic.

3. The primary inflammatory process persists, and the omental attachments around the diseased tissues persist also. A chronic tumor is formed, consisting of an inflammatory focus, surrounded by omentum. (abscess).

4. The inflammation terminates, the omentum becomes freed, but its tissues are so altered by the inflammatory process that thick cicatrices remain. If they are massive enough, the chronic tumor is accessible to diagnosis.

As examples of a speedy resolution the two cases mentioned before will serve; for the second outcome, a chronic tumor due to firm adhesions, I offer the following history:

A lady, æt. 28, was operated on by me, a year previously, for chronic salpingitis by removal of the uterine appendages. She made a slow recovery from the operation, as there was a left-sided pelveo-peritonitis following. She went home after a two months' stay, but returned a year after, because the pain in the left side had become more severe than ever. There was a tumor in the left parametrium, of the size of a small fist, felt through vagina and from without. No fever. The presence of adhesions and perhaps an abscess was to be expected. A new laparotomy revealed a mass of omentum adherent to the uterine stump; no abscess. This mass was detached, ligated and cut away. Improvement followed.

Adhesions forming after laparotomies do, no doubt, constitute the most common cause of failure to give the expected relief, and if I am correct, the omental ones are the most painful and annoying on account of their dragging on the stomach.

Proceeding now to such instances where the omental tumor continues to act as an enclosing bag all around the focus of in-

fection, mostly around a perforation, or, in other words, where the omental folds constitute the walls of a chronic abscess, I would report a case of perforating appendicitis in a young lady of 17 years, a patient of Dr. Walker, of Schulenburg. She was ailing for over a year from pains in the right so-called ovarian region, perhaps better expressed, cæcal region. There was hectic fever of a low type, and constipation, which latter, though, was easily regulated by medicines. Dr. W. suspected perityphlitis, but was handicapped by all kinds of family influence, and did not prevail upon the parents to allow operative interference. Patient, who had then gone through other medical hands, became finally so low that Dr. W., being consulted again, insisted upon an operation as the last refuge. Called to his assistance, I found patient in so desperate a condition that even an external examination seemed to be too much for her before she was put under chloroform. There was then found a tumor of the size of a child's head over right Poupart's ligament. Upon incision, purulent fluid, mixed with fæcal matter, welled out in great quantity. The tumor itself consisted of omentum, which enclosed an abscess cavity in communication with the perforated cæcum, or rather with the opening of a perfectly destroyed appendix into the cæcum, This abscess tumor was tightly closed up and shut off from the balance of the intraperitoneal cavity by omentum. I had to cut through the omental hull to find out the described condition. The fresh additional peritonitis, which had brought on the change for the worse, was due to a second perforation of more recent date, in the ascending colon. As soon as the case was cleared up, the hopelessness of it made us terminate the operation. The abdomen was washed out and drained. Patient died the following night.

Another still more remarkable case came in my hands in the John Sealy Hospital, only a few weeks ago. A married woman, of some 30 years, an invalid since her 16th year, and under constant medical care for uterine disorders, was sent in by Dr. E. Randall for operation for double pyosalpinx. Her womb was not very large, extending upward, so as to be felt as a nodulated mass over the symphysis. It was entirely immovable, and both parametrical spaces were filled with

doughy masses, which did not admit any differentiation of the parts. High fever and great suffering. Shortly after her entrance, purulent discharge from the rectum gave her some relief and diminished the fulness of the left parametrium. On her request laparotomy was undertaken, with the view to free the womb, and to do away with the pus in the tubes. The first thing I met was a large mass of omentum adherent to the fundus uteri, and constituting the largest part of the diagnosticated uterine enlargement. After its detachment it became evident that the omental fringes had closed up all around a uterine perforation on the summit of the fundus, and of the size of a 25 cent piece. The engorged omental portion was tied and cut away; the womb then resected in a funnel shape, and the wound closed. The right pyosalpinx was then opened and washed out. The patient here collapsed so much that the operation had to be terminated. She succumbed to shock and loss of blood in the following night. I do not see any other explanation for this extraordinary perforation, but that it was made long ago by some attempt at abortion, or by some injudicious intra-uterine manipulation. It was evidently of old standing, as the dark, ragged and indurated walls indicated. The omentum had performed its full duty in shutting off this door of infection from the intra-peritoneal cavity by forming a firmly adherent cap over the perforation.

I now approach the last class, the endo-omental tumor, without adhesions to other tissues.

Orth divides such processes into omentitis chronica fibrosa, omentitis fibrosa retrahens and omentitis adhesiva, the latter meaning adhesions between the different parts of the omentum itself. Here we are interested only in those cases which appear clinically as tumor-like formations, accessible to physical diagnosis. They are not very frequent, because the cicatricial mass is not often bulky enough to be felt through the abdominal wall. It is important, though, that we remember this variety of tumor, when swellings in the upper part of the abdomen have to be diagnosticated. The tumor will be rarely very large, it will be hard and nodulated, situated superficially and in front of the colon, will be movable in every direction, but in a limited circle. It will not be painful on touch, not growing, and

the history of the case will reveal some abdominal trouble pre-
ceding the discovery of the tumor, perhaps for years. Often
the swelling will be detected only accidentally. The differen-
tiation from tuberculous and malignant growth is easy. The
absence of cachexia, pain, ascites, etc., will at once settle the
benign nature. The same will be the case with pyloric cancer,
or that of the gall-bladder. Perhaps some non-malignant tu-
mors, belonging to these organs, may offer some differential
difficulty, but considering the perfect freedom from constitu-
tional disturbances, and the above mentioned peculiarities of
the omental tumor, we would not be very liable to make
mistakes.

Again, a movable kidney may be confounded with it, and,
vicé versa. But the kidney can be replaced, can be felt from
behind, is mostly covered by the colon, has a different shape
and surface, etc. Still, I recollect a case where it was difficult
to come to a satisfactory conclusion. Finally, tumors in the
abdominal parietes may come into question. If these latter
can be lifted up with the tumor, there will be no doubt left; but
if the tumor should have formed adhesions with the omentum,
a differential diagnosis may become even impossible.

One of my cases was a lady of some 30 years. She acci-
dentally detected a tumor, the size of a hen's egg, in a place
where we are used to look for the gall-bladder. There was not
the slightest suffering with it; the tumor was painless, hard,
superficial, could be moved in a limited area in all directions,
etc. Nothing was done for it, and it never annoyed the owner.

The following is the history of an extraordinary case, whose
description I found in the *Archiv f. klinische Medicin*, for Aug-
ust, 1874. A woman, æt. 57, very emaciated, with anasarca and
ascites, presents not a trace of liver dulness, even after tap-
ping. But there are two tumors, one in the upper portion of
the abdomen, directly below the parietes, and reaching from
the right mammillary line over into the left side. Downward,
in the height of umbilicus it has a sharp margin, with a distinct
notch. The surface is smooth. Dulness on percussion. The
second tumor is round, as big as a child's head, can easily be
palpated over the symphysis, and to the right of it. No con-
nection between the two tumors except by a string-like band.

Examination per vaginam, rectum, etc., reveals nothing to be used for diagnosis. The upper tumor is then considered to be the dislocated liver, the other an ovarian tumor. Post-mortem after one year of observation, by Prof. Ziegler. The upper tumor is not the liver, but the omentum which, by chronic inflammation, was thickened to the extent of $1^1/_2$ cm., whilst the exceedingly small liver is attached to the posterior part of the diaphragm, and covered in front by intestine and stomach. The lower tumor was an ovarian cyst, connected with the omental tumor by a thin band.

Treatment of Omental Tumors.

In acute cases the underlying trouble will, of course, be the object of treatment. Nevertheless, in cases of perityphlitis or of any other intraperitoneal infection, the suddenly appearing tumor has to be correctly diagnosticated, because only then will we abstain with perfect complacency from meddling with it. Nothing would be a greater mistake than to cut down on it for its removal. Obviously, the case would be infinitely aggravated by such an attempt. Even a simple incision must open anew the connection between the infecting focus and the peritoneal cavity, which, fortunately, had been closed by the adhesive omentitis. A different course, though, must be pursued when a greater quantity of pus has to be evacuated for the saving of the patient's life, as, for instance, in appendicitis under certain circumstances. Here, evidently, not the omental cake is the object of the operation, but the removal of the infecting material.

But even then we have to operate with a full understanding of the omental conditions. The operation has to be performed in such a way as not to break through the partition toward the intra-peritoneal cavity. In appendical and cæcal abscesses, for instance, the incision has to be made as much laterally as possible, because we may in this way get into the abscess without encountering the omental adhesions. The pus mostly breaks through the abscess wall on its weakest point, which is the lateral area not protected by the omentum. There the parietal peritoneum has made firm adhesions to the gut, and

when the pus breaks through, it gets into the præperitoneal cellular tissue in the iliac fossa. It thus forms a new abscess cavity, connected with the first one by a more or less wide opening. This latter may close entirely, leaving only the secondary abscess, the primary one having emptied itself and healed. But even if the connection persists, the superficial cavity will contain the bulk of the purulent secretion. For such cases all that is required, is a free incision into the superficial extra-peritoneal abscess cavity, which has to be treated exactly as any other superficial abscess. If no operation is decided on, warm fomentation over the tumor, absorbent inunctions, etc., may be tried. I think massage should not be risked during the acute stage. Rest, of course, is the great remedy, and rest especially to the bowels, so as to favor omental adhesions. I confess that I give opiates, rather than salines, whenever I see an omental cake appear. I do not subscribe to ironclad rules in the treatment of peritonitis any more than in any other disease.

The next question is: What to do with the chronic omental tumor, after all inflammatory symptoms have subsided? If there is no trace of fever, no indication of persistence of the primary disease, if there is nothing but the tumor left, then our action should be based on the amount of suffering justly ascribable to the tumor. If there is no suffering, it should not be touched, but if the omental adhesion, by dragging on one or the other abdominal organs, or by interfering with its blood supply, should do harm, then I do not see why it should not be done away with. Especially is this a necessity after laparotomies, whose aims often enough become frustrated by such new and unforeseen accidents. Therefore, if massage, warm baths, resorbent internal and external treatment have failed, a new laparotomy ought to be performed, the omentum detached, and as much of it as seems necessary cut away. If we do not resect the detached fringes, there is great danger that they attach themselves anew. It is true, the cut surface of the omentum has also the tendency to fix itself to the nearest serous membrane, but it will then come in contact with healthy tissues, and the liability to new adhesions is greatly lessened.

The treatment in such abscesses as are surrounded by an

omental hull, ought to be similar. If it can safely be done, the omentum ought to be detached and removed; but in such cases where there is danger in tearing away the adherent parts of other structures, especially of the bowels, it has been sufficiently demonstrated by experience, that it is safer simply to empty the abscess. It is remarkable how, after the cause of the irritation has been removed, the parts may become separated from each other, and how quick they may regain their normal conditions. But even if the omental tumor should remain, it will be the lesser of two evils.

In conclusion, a few words in regard to the treatment of the cicatricial endo-omental tumor: As it is harmless, no sensible surgeon will think of meddling with it. The uneasiness of the patient will best be relieved by an explanation of the nature of the trouble.

IMPAIRMENT OR LOSS OF THE SENSE OF SMELL AS A MEANS OF DIAGNOSIS.

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DYSOSPHRESIA or impairment of the sense of smell, distinguished from anosuria, or total loss of the sense, is not very easily estimated. So much depends upon the reliability of the patient's description and the accuracy with which he has been accustomed to estimate the impressions on his senses. In speaking of smells or tastes, there is often a tendency to exaggerate, and on the other hand, persons whose senses have always been dull and blunted from their birth seldom give themselves much trouble in describing their impressions, or, if they do so, do it inaccurately. Dys-osphresia is then, I think, a common congenital defect, and being so its presence is not of much value as an indication of disease. Still, whenever the taste for flavors and the sense of smell is strikingly impaired, it is well to seek for some local obstructing cause. With many people an ordinary catarrh deadens the taste and smell very remarkably, and, as the cold passes off the taste and smell return. If, however, there is an intermittent failure of smell coming on rather frequently, it will generally be found that there is some form of chronic rhinitis, and the most common form indicated by this symptom is that associated with gelatinous polypi.

It is well known that polypi are liable to variations in bulk, these variations depending partly on the state of the health of the person affected by them. The loss of smell has the same intermittent character in the early periods of the case. Later on, if the nostrils have been uninterruptedly blocked by

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polypi for a considerable period, the sense becomes permanently impaired or destroyed. In the case of the other forms of nasal stenosis the progress toward an absolute anosuria is more steady and uninterrupted.

Supposing, however, that after an examination of the nostrils with the rhinoscope, no hypertrophy or growth is found, there may be the condition known as chronic atrophic or fœtid rhinitis, and in this, too, anosuria is very often present. Ulcerations, necrosis and caries of the bones are also associated with the same symptom, and the same may be said of facial paralysis with involvement of the fifth fascia, and a consequent disturbance of the nutrition of the mucous membrane.

But anosuria is, medically speaking, a much more serious symptom when it is not to be accounted for by any ascertainable local disease in the nostrils.

It may indicate intra-cranial disease or injury. Should the symptoms have come on suddenly after a fall upon the back of the head, it may indicate a separation of the olfactory bulbs from the lamina cribrosa. A few rare cases are recorded in which this has occurred. In other cases the injury has been more extensive, and has involved the cerebral olfactory center which, according to Ferrier's most recent observations, is situated in the temporo-sphenoidal lobe. A striking case, illustrating this piece of anatomy, was brought before the medical society of London by Drs. Hughlings Jackson and Dr. Beevor about a year ago. Perversion of smell in this case was noted as a prelude to epileptic fits, which preceded the gradual access of dementia, ending fatally, and in the post-mortem inspection a tumor, involving the tempero-sphenoidal lobe, was found. In any case similar to the above, in which the olfactory aura was marked, it is a question whether the case should not be handed over to the surgeons, for the purpose of trephining and endeavoring to find the cause of the mischief. In investigating cases in which the patient complains of an unpleasant odor which is imperceptible to those around him, it is well to bear in mind the possibility of this not being really a subjective parosmic affection. It may be due to fœtid pus finding its way intermittently into the middle meatus from the antrum or even from the frontal or sphenoidal sinuses. The diagnosis

is often very difficult in the case of antrum abscess, and hence
the value of any indication such as that of an unpleasant odor,
of which the patient only may be conscious.

The position of the patient's head makes a great difference
in the presence or absence of a discharge from the antrum. In
order, therefore, to make the diagnosis effectually, it is well,
should there be any discharge in the nostril affected, to remove
it carefully by means of cotton wool until, when examined
with the rhinoscope, the middle meatus appears to be free
from any discharge. This done, the patient is requested to
bend the head forward and below the level of the rest of his
body, and to incline it to the opposite side. After remaining
in this position for about a minute, the nostril is again exam-
ined, and if pus of a fœtid character is now found in the mid-
dle meatus, it is a strong argument in favor of the case being
one of antral abscess. The pus removed on the point of the
probe should be smelt, and if fœtid, the diagnosis is almost cer-
tain.

A good many cases of subjective smells of an unpleasant
kind are difficult to explain. Some, I think, are due to the ac-
cumulation of effete products in the blood, and indicate a con-
dition allied to gout. I regard these cases as analogous to the
parosmic condition of persons who have taken ether by inha-
lation. If the patient has been long under the influence of the
ether he will smell and taste it and nothing else, whatever he
eats or drinks, for hours. As the ether is eliminated through
his lungs and skin, he gradually loses the unpleasant smell and
taste. Some of these cases of temporary parosmia are very
curious. A gentleman who consulted me some time ago said
he could smell nothing, but that the only taste that was pres-
ent to him was that of haddock. His loss of smell came on
about a fortnight before I saw him, during a severe cold, and
he thought the persistence of the "haddock" taste was due to
the fact of his having eaten some haddock just before he lost
his sense of smell.

A case of intermittent parosmia came under my notice. A
gentleman, æt. 39, had been living at an altitude of 6,000 feet
above the sea level in the Rocky Mountains two years before
I saw him. Ever since he had had an odor which he de-

scribed as that of "bad size," coming on every day at 10 and
lasting till noon, when it passed off. Treatment had been
long and persevering, but without result. This periodicity of
parosmia has been noticed in other cases, but I am not aware
that any satisfactory explanation has been given.

In these and similar cases some hope for remedial treatment
is to be entertained, but when there is a complication of some
neurotic kind, such as epilepsy or insanity, the probability of
some tumor or disease in the neighborhood of the tempero-
sphenoidal lobe will obviously suggest itself. Should there be
a syphilitic history the probability is in favor of a gumma in
this region and the treatment will, if successful, be confirma-
tory of the diagnosis. The possibility of optic neuritis being
present should not be overlooked, and it should be part of the
routine practice in all these obscure cases to examine the re-
tina opthalmoscopically. Should optic neuritis be discovered
it very much strengthens the view of the seat of mischief be-
ing cerebral, and it is important to note that optic neuritis
may be pretty far advanced before any serious or noticeable
defect of vision has shown itself. If found, the chances of re-
covery of the patient are very slight.

An olfactometer (according to the *Revue Scientifique*)
has been invented. I do not anticipate much advantage
from this instrument, as an aid to physiology or medi-
cine. We want first a classification of odors and a "prismatic
analysis," so to speak, of the elementary principle, whatever
it may be, upon which (when broken up by this analysis)
odors depend. The Newton who is destined to do this for us
has not yet appeared upon the scene. When this has been ac-
complished, and a standard of normal olfaction has been laid
down and generally accepted, the use of the olfactometer may
be an addition to our means of diagnosis.

THE MÜTTER LECTURES ON SELECTED TOPICS IN SURGICAL PATHOLOGY.

SERIES OF 1890-1.[1]

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LECTURE V.

PERITONITIS.—TESTS FOR ANTISEPTICS.

SYLLABUS.—*Peritonitis.* The peritoneum and its capability of absorption; rapidity of same. Influence of any ascitic fluid present. Effect of injections of various pyogenic organisms and in varying quantities. Infection of peritoneal wounds. Forms of peritonitis. Conditions under which infection takes place Improbability of a pure type of gonorrhœal peritonitis. Distinction between septic and putrid forms of peritoneal inflammation.

Testing antiseptics. Method of testing the relative antiseptic value of a chemical substance with various pathogenic organisms. By the hanging drop. With spore-threads. Determination of necessary length of exposure. Results with solid culture media. Estimate of its absolute as well as its relative toxicity.

Application of these methods to an estimation of the new drug *Pyoktanin* Disappointment experienced here as with all other drugs of its class.

OUR views concerning the susceptibility of the peritoneum and its intolerance of insult have undergone wide changes within the past few years; indeed it would almost seem to be more tolerant than other serous cavities or ordinary subcutaneous tissues. The explanation of this condition is to be found in the character of this membrane, and the conditions which obtain when pyogenic organisms are therein introduced; and first of all comes into play its wonderful capability of ab-

[1]Delivered before the College of Physicians, Philadelphia, December, 1890.

sorption, by which micro-organisms are deprived of their necessary nutrient fluid, along with which, as it returns to the vessels, it is quite possible they may pass into circulation to be there destroyed. For instance, Wegner introduced 200 cc. of warm serum into the peritoneal cavity of a rabbit, and an hour later bled the animal to death; the amount of fluid then present in the same cavity was only 66 cc. showing that 134 cc. had been absorbed within an hour. When fluid of lower specific gravity than blood serum is introduced, it seems to lead at first to a transudation from the blood. It is very different with a fresh wound, since here we have not an active absorbing surface, but rather the contrary. Wegner further showed that a great variety of fluids free from bacteria, such as water, urine, bile and blood may be introduced in the same way without bad results. So even with large quantities of un-filtered air. If too large a quantity of fluid capable of putre-faction be introduced at the same time with unfiltered air then there is rapid decomposition. Thus if 50 cc. of such fluid are introduced into the abdomen of a rabbit, of which only a part can be rapidly taken up, the rest furnishes a suitable medium for the growth of the organisms present in the unfiltered air which has been injected, inasmuch as such air contains ordinarily saprophytic but not pyogenic organisms. Wegner more often produced septic intoxication than true septic peri-tonitis.

Reichel has quite recently published an essay containing a mass of clinical reports, in which he seeks to discover what particular conditions favor the occurence of peritonitis. A series of experiments in which he injected pus with gelatine into the peritoneal cavity confirm the statement of Wegner and of Grawitz that the peritoneum is capable of absorbing a certain amount of pyogenic organisms, but that injections of relatively too large amounts are fatal. He made a number of experiments by excising a small area of peritoneum and rub-bing into its denuded surface the organisms with which he was experimenting. Four out of five animals withstood this inoculation, although Grawitz did not meet with the same suc-cess in similar experiments. The results gathered from a large number of abdominal sections in human beings agree

pretty well with his experimental results. In complicated
ovariotomies the peritoneum equally easily reabsorbs these
foreign organisms. Ascites, which frequently occurs, offers a
fine culture fluid for the growth of bacteria, and increases the
danger of peritonitis. Separation of adhesions favors inflam-
mation just as in the experiments above detailed, and for the
same reason. A recent or fresh attack in infectious peritonitis
does not seem to increase the danger of septic inflammation.
(*Deutsche Zeit. f. Chir.*, xxx, 1 and 2).

Predoehl has investigated fourteen cases of suppurative peritonitis. The strepto-
cocci were found most commonly.

Fraenkel has also assigned the predominating role in peritonitis to the streptococci,
finding them in two-thirds of all cases, especially in the more rapid forms. Only in
the more slow cases did other forms appear, which proceeded probably from the in-
testine, and seemed sometimes to destroy the streptococci or at least antagonize their
action. Fraenkel cultivated the streptococcus pyogenes from this source, and with
it produced a typical erysipelas on the ear of a rabbit; also a typical peritonitis and
panophthalmitis after injecting it respectively into the peritoneum and the eye.

Pawlowski undertook a series of experiments to corroborate the statements of
Grawitz, who injected large quantities of staphylococcus aureus into the peritoneal
cavity, without producing peritonitis. He had already shown that after the injection
of such irritating substances as croton oil, an inflammation of a sero-hæmorrhagic
character, but not septic, was produced. He began this latter series with relatively
large quantities, which he gradually reduced, and found that only small quantities were
absorbed without injury. With the bacillus pyocyaneus he produced for the most part
only a fibrinous hæmorrhagic inflammation, which several days later became puru-
lent. He also endeavored to ascertain just what element of the intestinal contents
produces perforation peritonitis. He showed that filtrated intestinal contents free
from bacteria are not pathogenic. Evidently, therefore, bacteria are the agents, and
he isolated a short, rapidly growing bacillus, the injection of which into the peri-
toneum produced suppuration for a time. He also showed that given quantities of
staphylococci which by themselves were incapable of causing inflammation, could,
nevertheless, do so if croton oil were introduced at the same time. (*Virchow's
Arch.*, 117).

In opposition to Pawlowski, Waterhouse, working under
the direction of Orth, came to results which agree for the most
part with those of Grawitz. He was able to inject much
larger quantities of staphylococci into the peritoneum, it mak-
ing no difference whether they were injected through a canula,
or after incision into the peritoneum with the endeavor not to
injure the intestine. He seems to have demonstrated that

peritonitis occurs only when absorption is interfered with. He found also that the simultaneous introduction of blood, or strong meat broths, or ammoniacal urine or turpentine, along with the introduction of pus is always dangerous So far as the infection of peritoneal wounds is concerned, it appears from his experiments that a well sutured wound does not favor growth of organisms, but that large defects in the abdominal wall, or the mesentery, prove favorable fields for the growth of bacteria. Previous disease of the peritoneum, such as ascites, seems to favor peritonitis. He found that after inject-ing staphylococci several hours after an artificial obstruction, which latter of itself would be harmless, purulent inflammation supervened. Especially noteworthy were his results when, after producing such intestinal obstructions, he injected the cocci, not into the peritoneal cavity, but into the veins, or into the bones, muscles, or other tissues. It appears therefrom that the microbes thus brought into contact with the intestinal lesion do not perforate intestinal walls as long as they are not necrotic. (*Virchow's Arch.,* 119).

At the sixty-second Congress of German Naturalists, Orth detailed some of his experiments in the production of peri-tonitis. Alluding to the wonderful resistance which the peri-toneums of animals have shown after injections of putrid sub-stances, etc., he claimed that if the peritoneum be injected with the same material in less absorbable shape the result is different. Such a condition is obtained when pure gelatine and agar cultures of pyogenic organisms are used, or fifteen to twenty centimeters of freshly injected blood, so that some remnant of the injection can still be found three days later. He thinks that large amounts of pure blood clot alone are sufficient to set up peritonitis, probably not alone from bac-teria but from some fibrin ferment.

Previous visceral lesions favor the activity of these organisms. In ascitic animals 1 cm. of staphylococcus fluid will cause fatal results in three to four days. In the same way excision of a piece of peritoneum, or irritating a small area with turpen-tine, lower its resistance greatly. Numerous experiments were made to estimate the effect of vascular disturbances. Loops of intestine were strangulated for various times. It was found that a ligature of the loop for four to six hours, by itself, did no harm, but if this were followed by injection of the above fluid peritonitis quickly

ended the animal's life.   Even when the strangulation lasted but two to four hours,
the injection of four drops of fluid into the vein of an ear caused death in twenty-
four hours.   The streptococci appeared a little more slow in their action than the
staphylococci.

If after temporary artificial strangulation a fracture be sub-
cutaneously made, and the injection made into the fracture
wound, the result is the same.   In other words, by indirect or
direct introduction of pyogenic organisms peritonits can be set
up and rapidly prove fatal *providing* the local disposition be
present.

Grawitz, in a careful study concerning the origin of peri-
tonitis, has formulated the following dictum.

Pyogenic organisms mixed with absorbable amounts of in-
different fluid and injected into the normal peritoneal cavity
produce peritonitis only when:

1. Introduced in excessive amount.

2. When at the same time some substance acts to produce
necrosis of the tissue and thereby to prepare the way for pen-
etration of the cocci into the deeper layers of the serous mem-
brane.

3. When especially some wound of the abdominal wall
favors localization of infection.   (*Charite Annalen.*, 1886).

Pawlowski, in his researches elsewhere alluded to, had some
curious results bearing on the topic now under consideration.
He found that injections of fresh normal fæces gave rise to
fatal fibrino-purulent peritonitis, which he considered to be
produced by a particular bacillus which he termed *bacillus
peritonitis ex iutestinis cuniculi.*

He agrees with observers who claim that the pyogenic cocci
all thrive with the greatest activity when they find in the peri-
toneal cavity any dead or dying tissue or cells.

He distinguishes two forms of peritonitis:

1. That produced by chemical agencies such as croton oil
and trypsin, of hæmorrhagic form.

2. That produced by infection.

  a. Peritonitis mykotica, of violent severity, without pecu-
liar macroscopic features, showing microscopically exuberant
proliferation of the micro-organisms on the serous surfaces.

  b. Less violent type, beginning as a hæmorrhagic form.

c. Fibrino-purulent form, representing the mildest infectious variety; usually the commencement of the ordinary purulent peritonitis.

In general, Bumm makes the following different classification of forms of peritonitis, yet one which is certainly accurately founded.

I. Aseptic, usually local, sometimes generalized. It progresses to fibrinous exudate and possible adhesions. In this form there is no bacterial invasion.

II. Septic.

a. Streptococcus and staphylococcus peritonitis. Usually puerperal.

b. Putrid peritonitis. Usually post-operative or perforative. Is a mixed infection. (*Vide* Lect. X.).

The former happens most often after parturition, begins with a chill, and is accompanied throughout by high fever. On section is found thin, purulent, odorless exudate, or if late this may be thick and creamy; this exudate early in the disease is very infectious, but loses in virulent intensity as the disease progresses. As the streptococcus belongs to the facultative aerobic organisms and loses its virulence by exposure to the air, we may find here the explanation of the fact that the exudate is more infectious than the cultures of the germ. The path of infection from the genitals to the peritoneum is by no means always clear, since sometimes the tubes are quite free from the organism.

The putrid peritonitis occurs most commonly after operations; it begins without chill, with fever, which gradually runs higher, and is characterized by a putrid, ill-smelling exudate. This is slightly, if at all infectious, and contains a mixture of several organisms, many of which at least are in no wise pathogenic. This disease is the result of putrefactive organisms, which extend at the time of the operation, and quickly work their evil effects. The febrile symptoms are mainly due to ptomaines. The disease is spread locally by movements of the bowels, peristalsis. Other forms of mixed infection from perforation, etc., can hardly be classified.

III. Specific. Tubercular; Gonorrhœal (?). This last form

is as yet problematical. (*Münch. med. Wochenschrift,* 1889, No. 42).

Bumm further questions the possibility of a pure type of gonorrhœal peritonitis. Pure gonorrhœal pus which escapes into the peritoneum from an infected tube-sack, acts, he says, like an aseptic foreign body, and becomes encapsulated. If the contents of the tube present a mixed infection then the result may be very different.

Pernice experimented extensively to help settle this operation. He found that various chemicals like concentrated acids, phenol, strong corrosive sublimate solutions, etc., injected into the abdomen of guinea-pigs and rabbits, produced undoubted peritonitis with necrosis and perforation. But the character of the exudate was always serous or sero-fibrous, never purulent. (*Rivista Inter. di med. e. Chir.,* 1887).

Pawlowski made over a hundred quite similar experiments. Croton oil and trypsin in dogs and rabbits produced acute hæmorrhagic but not purulent peritonitis. Non-pathogenic organisms were introduced in large numbers; they produced no inflammation, even when introduced with small doses of irritating chemicals. Quite otherwise, with cultures of the pyogenic microbes; the staphylococcus pyogenes aureus produced frequently fatal purulent peritonitis; indeed he had much more pronounced results with these cocci than some others have had.

The ordinary septic peritonitis following confinement is a streptococcus infection Whether the cocci work along through the vaginal and uterine surfaces and thr. ugh the tubes to the peritoneum, or whether they pass by the lymphatic vessels directly to the serous covering of the uterus, has not yet been definitely settled; if indeed they do not take either course according to circumstances. In two cases of this nature, however, Bumm has found the tubes completely free of bacteria.

In the most rapidly fatal cases one finds in the peritoneal cavity a thin, flaky, yellowish fluid, which if removed by aspiration immediately after death has no odor. It contains fibrin flakes, endothelial and pus cells, and streptococci. These latter are found as well in the genital tract, in the blood and most of the internal organs. This fluid is extremely infectious. A fraction of a drop injected into the abdomen of a rabbit sets up a violent commotion which is fatal in twenty-four hours. Injected in the tissues in trifling amount and well diluted it sets up an acute phlegmon which is rapidly fatal.

In the slower forms of puerperal streptococcus-peritonitis the peritoneal exudate is more purulent in appearance, but less virulent in its properties. Of this it takes from a few drops to two grammes to set up a fatal peritonitis in a rabbit.

So also the reaction on subcutaneous inoculation is less violent. It appears, as Bumm says, as if the virulence of the material is the more diminished the longer it is exposed to the action of living cells.

Experiments made with this exudate from fresh cases give constant results; it seems however that experiments made with pure cultures of the same organisms are followed by most uncertain consequences. It is hence abundantly proved that by cultivation these organisms loose their virulence, a fact which we know as well of the bacilli of anthrax and tubercle. Widal has referred this peculiar alteration of malignity to the fact that these cocci when at their best are ærobic, and that when cultivated in a hydrogen atmosphere they retain their infectiousness. The fact well known to laboratory workers that streptococci grow better along the needle streak than on the surface also bears out this view.

The course of an ordinary traumatic (post-operative) peritonitis, like the findings, is somewhat different. The dirty looking, sometimes badly smelling, peritoneal exudate contains now not any specific organism, but shows a mixed infection, cocci and bacilli being often found together. By plate cultures several different forms can be isolated. Intra-abdominal injections of such cultures, in rabbits, usually give no results. Only the original peritoneal exudate, and this often in considerable quantities, seems not to be infectious.

Between these two varieties of peritoneal inflammation there are thus seen to be differences not merely clinical; and Bumm, as shown above, has proposed to call the former the *septic*, the latter the *putrid*. His explanation is about as follows: No one who has done bacteriological work but knows full well that no laparotomy can be done without exposure to germs and their contact with the parts exposed. Aseptic operating comprises, virtually, exclusion of the majority of organisms and trusting to the resistance of the tissues to dispose of those not excluded. Ordinarily such microbes as enter the abdomen are killed by the cells or fluids in which they lodge. But when the peritoneum is too severely attacked, or is already weakened in resistance, then surroundings are made favorable for such germs as have entered, and the process if once begun

can scarcely be checked. By peristaltic action infection is spread, and by the peculiar capability of absorption which the peritoneum possesses an enormous number of organisms enter the blood, so that patients soon succumb to putrid intoxication.

Between the septic and putrid varieties we have these distinctions:

In the former we have pus instead of ichor, and acute onset with chill and high temperature instead of a more deliberately and gradually febrile clinical picture.

As a result of these, and hundreds of similar experiments, we have learned that to produce suppurative peritonitis it is necessary either to introduce the cocci in such numbers along with their products, that a part of the peritoneum be so affected as not to exercise its proper function; or they must be introduced into an already unhealthy peritoneum, or there must be present too large a quantity of fluid to be quickly absorbed; or finally there must be present some material such as blood-clot, or dying or dead tissue, in which they can develop. (Cheyne) As Cheyne has shown, suppurative peritonitis occurs with the greatest certainty when there is a wound in the abdominal wall in which infection can occur, and from which, as a center, organisms are constantly given off into the cavity within. This is still more certain to occur if the wound be an unhealthy one. For example in rupture of a healthy bowel, if the extravasated contents are thoroughly removed and the wound early approximated, recovery commonly occurs. But in perforation after typhoid the bowel-wall is unhealthy and forms a nidus in which organisms may grow and the only prospect of success is by resection, that is removal of the un-healthy tissue.

E. Frankel has called attention to the clinical fact that the more rapid the case of peritonitis the more likely we are to find pure cultures of the streptococcus in the pus. (This can hardly apply to a perforative form of the disease.) He also shows how hard it is to always recognize streptococci on gelatine cultures alone and at ordinary temperatures, and how much more accurately this may be done with glycerine-agar media at blood temperature; and he ascribes, and with propriety, some of the negative or contradictory findings of pre-

vious observers to lack of this precaution. He also regards this streptococcus (pyogenes) as identical with that of erysipelas; and he has produced this latter disease by inoculating animals with pure cultures taken from the abdominal cavities of animals with peritonitis. With the same organisms injected into the eye he has produced, moreover, panophthalmitis, and when injected into the cellular tissue purulent infiltration.

Of the many non-specific organisms often met with along with the streptococcus, most possess the property of curdling milk and of decomposing albumen, and this latter property cer-tainly works no benefit for the patient. Many of them produce ptomaines which have highly toxic properties. Boiled cultures of these organisms are still highly toxic, which is not true of streptococcus.

Fraenkel can hardly agree with Bumm in his differentiation between *septic* and *putrid* peritonitis, but he finds that the pure streptococcus forms give at least an odorless exudate.

He further describes a form of peritonitis determined by inorganic chemical agencies, and alludes to the frequency with which gynæcologists use tincture of iodine and iron salts. These substances, even when absolutely sterile, have the power of provoking a sero-fibrinous but not purulent inflammatory exudate, which is absolutely free from organisms and odorless. If the animal or patient live long enough this may be invaded by organisms from the intestinal canal. (*Münchener med. Woch.*, 1890, No. 2, p. 23).

THE TESTING OF ANTISEPTICS.

For the purpose of testing an antiseptic it is not enough to mix it in certain definite proportions with various nutrient media, and then endeavor to ascertain whether this or that organism will grow therein. Even if it will thus grow we have still very much to determine as to matters to be commented upon later; whereas, if it will not grow upon one or two trials it might be assigned an altogether false position.

There is systematically carried out in the laboratory of the Hygenic Institute in Berlin a method which, though long and somewhat tedious, leaves virtually nothing to be desired in determining the exact bactericidal properties and toxic effects of a given agent. It is practically a method laid down by the great master Koch, and carried out and taught by his assist-

ants, to whom, especially to Dr. Behring, I am indebted for an acquaintance with it. It is briefly as follows: A soluble antiseptic must be dissolved in solutions of known strength; an insoluble material can hardly be properly tested. We begin, therefore, with a standard solution of the substance to be tested, and this should be of the strength of, say, 1 to 1,000. It is now convenient, knowing the dropping glass or the pipette with which we are to work, to ascertain now many drops, as they fall from its point, will constitute 1 cc. Let us suppose for illustration that this number is 80; obviously then, one drop of this standard solution contains $1/_{80,000}$ of a gram of the substance to be tested. Two drops equal $1/_{40000}$ four drops equal $1/_{20000}$, and forty drops then equal $1/_{2000}$. We experiment first with bouillon duly sterilized, and in sterilized tubes. It is best also to select three typical pathogenic organisms with which we shall conduct three preliminary series of experiments.

First, anthrax, which is the most resistant and tolerant of all of the common forms; and second and third, the staphylococcus aureus and the streptococcus pyogenes, which are representative species of generic groups that give surgeons the greatest trouble. Now 4 cc. of sterilized bouillon are placed in a tube and inoculted with a fresh, pure culture of anthrax. After the tube is thoroughly shaken, a small drop of the infected bouillon is removed with a fine platinum loop, placed upon a clean cover-glass, and this is inverted over a hollow slide, and sealed with vaseline; in other words, this is a pure culture of anthrax in a hanging drop, and is used for control. To the same tube of bouillon is next added one drop of the standard solution above referred to. One drop mixed with 4cc. now gives to the solution a strength of $1/_{320000}$. This is shaken and a drop of this placed upon another cover-glass. A second drop is now added to the same tube, which so far strengthens the solution as to give it now a strength of $1/_{160,000}$; after making a culture of this strength, two drops more are added, thus making it $1/_{80000}$. The next dilution is made with four drops more, which, with the four previously added, make eight drops in all, or a strength of $1/_{40000}$. Next, eight drops more are added, giving it a strength of $1/_{20000}$, and next sixteen

more, which with the previous sixteen, make thirty-two drops now added to the solution, and giving it a strength of $^1/_{10000}$. This process is carried out as far as we choose to conduct it, making a fresh hanging drop culture with each fresh addition of standard solution. Each slide is carefully marked with the character of the culture and the strength of the solution, and all are the placed in a cage or suitable holder, which is then placed in the thermostat where it is kept at blood heat; after twenty-four hours the slides are removed and each one carefully examined under an immersion lens. A table is then constructed showing in just what strengths of solution bacteria are found after this interval, where they begin to fail, and where they are not found. The slides are then restored to the oven and the same observations are reported at the end of the second and of the third day. The results thus obtained give us our first working data with the organism in question.

In the experiments which we are supposing, the same investigations must be made with the other two forms of bacteria above alluded to, since it will be found that a solution strong enough to kill staphylococci will by no means necessarily destroy the anthrax bacilli.

Conversely, however, we may hold that anything which will destory anthrax bacilli will almost certainly kill all other pathogenic bacteria.

Next, we introduce a series of cultures made with the so-called spore threads. These consist of ordinary linen or cotton threads which have been sterilized by heat, and which are then left for a few hours in pure bouillon or fluid cultures of the above organisms; they are then removed and dried in a safe place. With organisms which produce spores these threads become impregnated with the same, and the latter will preserve their vitality for months or even years. If, now, small particles of these threads be clipped off with sterilized scissors, and a little particle immersed in our hanging drop, there will develop there the typical organism just as under other favorable circumstances. These spore threads are used in much the same way, as above detailed; a control culture is first made, or better two of them, by placing one of these particles in a hanging drop of pure bouillon. To 4 cc. of this same

bouillon are now added, drop by drop as before, given amounts
of the standard solution; with the addition of each proportion a
hanging drop culture being made, by inserting a particle of
spore thread.

By means of the first series of experiments just detailed, we
can narrow down within certain limits the proportions between
which we must further work, and our experiments are thus
made less discursive.   These spore thread cultures are placed
in the thermostat as before, and observations are made at the
end of the first, the second and the third day, and the results
tabulated again.   This method is simple, and has much in it
to attract and commend itself.   It is, however, open to serious
error, inasmuch as the various antiseptic solutions exert differ-
ent effects upon the material of the thread or are themselves
altered by it.   For instance, if it is with aniline dyes that we
are experimenting, the vegetable fibres take up a certain
amount of coloring matter, thereby depriving the solution of
so much, and vitiating our calculations.   If it is with such sub-
stances as mercuric chloride, zinc chloride or silver nitrate that
we are working, they also undergo mutual reactions with the
same disturbance of relative strengths.   So that before these
tests can be considered thoroughly reliable, we must deter-
mine what these mutual reactions are.   There is, further, a
most important practical deduction from the above statements,
since for wound dressings we depend upon vegetable material,
usually cotton, which is saturated or impregnated with antisep-
tic solutions of various strengths.   It will be seen, therefore,
that it does not follow by the time these dressings are
acted upon by wound discharges, the proportion of antiseptic
which they contain will be the same as at first prepared; in
other words, a so-called antiseptic dressing may not be nearly
as much of a protection as it would appear to be.

After determining the value of an antiseptic by the hanging
drop experiments, it is necessary to determine its activity in
the direction of the length of exposure necessary for the de-
struction of bacteria by solutions which have a sufficient
strength, as determined above, to produce a bactericidal effect.
For instance, in a strength of $\frac{1}{3000}$ a given organism does not
grow in the hanging drop after 24 to 72 hours.   If this has

been determined, we must next make clear how long it takes a solution of this strength to kill this same organism. Suppose that we are working with a given antiseptic designated by X, and with anthrax.

Bouillon is impregnated with this X in a proportion of one to three thousand, it is then inoculated with a pure, fresh culture of anthrax, and carefully shaken. At stated intervals one drop is taken from this tube and planted in another of pure bouillon; these tubes are then placed in a thermostat and, after 24 hours' exposure there, the results as to growth or no growth are carefully noted. The intervals alluded are purely arbitrary, but are as follows: After five minutes, after two hours, and after twenty-four hours. The first period of five minutes is selected as representing such exposure as the conventional irrigation of a wound would offer; and the second and third are purely matters of convenience. These experiments should be repeated, only using blood-serum instead of bouillon. Such experiments have the definite object of demonstrating whether the given antiseptic, X, is of value when used as irrigating fluids are usually used in surgery; and they must be repeated with the staphylococcus and the streptococcus. Then bouillon cultures made like those just referred to should be mixed with X in the same proportion, and after the same intervals of time should be injected into animals, and results noted.

Furthermore, it is necessary to determine whether after a given time, say five minutes, all the organisms in a given tube are killed, or only the larger proportion. For these purposes take 5 cc. of pure bouillon in a tube, inoculate it with anthrax, shake thoroughly, remove 0.1 cc. with a sterilized pipette, add this to 5 cc. of gelatine, and make a plate culture in which after twenty-four hours the colonies are to be counted. Into the same tube of bouillon put X in the proportion of 1 to 3,000, and after five minutes again remove 0.1 cc. with the pipette, add this to 5 cc. of gelatine, make another plate culture, and so again after two hours and after twenty-four hours. After one day's exposure of these plates, which are supposed to have been kept at the same temperature with the same surroundings, either in a room or in a thermostat where the temperature is somewhat low, a count of each plate

is made.   The number of colonies in the first plate, multiplied by 50 ($=5$ x o.1), represents the number of bacteria in the tube of the bouillon before its inoculation; while the results gained from the other plates, multiplied by 50, show the various inhibitory effects of varying lengths of exposure.   These experiments must be several times repeated, or several series must be undertaken at the same time, in order to give reliable data.

After determining the antiseptic power of a substance as the above investigation will reveal it, it is very necessary to determine whether it is poisonous or not.   This is determined as follows: A given substance for example X again, has been found to possess antiseptic, *i. e.*, bactericidal virtues in a proportion of 1 to 1,000.   A rabbit weighing a thousand grams, as the average rabbit will weigh, or thereabouts, has injected subcutaneously one gram, in solution, of this same X; into another rabbit another gram is injected into the peritoneal cavity, while it is injected into a third by the intra-venous method.   Each rabbit has now received $^1/_{1000}$ of its weight of X, and it remains to be seen whether the living animal can survive this strength any better than could the bacteria.   If not, then X is to be considered *toxic*, and its *relative* toxicity is to be determined by further experiments conducted after the same fashion.   If it can, then we have at last found that long desired substance which is parasiticide to bacteria, but with which the living organism can be impregnated in strength sufficient to kill such bacteria as may affect it.

But supposing that one gram of X is soluble only in 10 cc. of water, then our experimental rabbits must receive injections which are of themselves copious enough to injure or tu kill. No rabbit can withstand the introduction at one time into the peritoneal cavity of 10 cc. of fluid.   In such a case we take a smaller animal, for instance a white mouse, one such as will usually weigh 20 grams.   This mouse must receive an intra-peritoneal injection of $^1/_{1000} \div 20 = ^1/_{50} = 0.02$ gr.   This amount of the same X would equal $^1/_5$ cc. of fluid, which a mouse should easily bear in the peritoneal cavity.   This method is, however, accompanied by difficulties.   If we are experimenting with a strong antiseptic like a mercuric chloride, it can only be used in very weak solution, the strongest of which can

be used only in $^1/_{500}$ strength, otherwise it would act as an irritant or even caustic, and so prevent the results we desire to obtain.

This determination of the poisonous properties of X is essential if we desire to so saturate the system with the substance that its antiseptic properties shall be exerted throughout the body, and this method of determination must be carried out with great nicety. According to Behring, we must make out, not only the relative, but the *absolute toxicity* of a given substance; its absolute toxicity being the proportion in which it will kill an animal, its relative toxicity the proportion in which it will kill bacteria.

Until the present time no substance has been discovered whose absolute toxicity is not greater than its relative. In other words, we have not yet discovered that which will not kill in the animal in $^1/_4$ or $^1/_5$ of the proportion required to kill bacteria. When we have discovered that one of which this cannot be said, we shall have learned to conquer sepsis. In many respects the serum of certain animals most nearly approaches this desired substance, but this only for certain bacteria. It is, for example, known that anthrax bacillus will not grow upon rat-blood serum, although it will upon serum from other animals. Streptococci will not grow on calves-blood serum— only on rabbit-blood. Within the past few years numerous investigations have been made regarding the antiseptic properties enjoyed by blood serum, from which it would appear that it affords the greatest protection which our systems enjoy to have circulating in our blood serum of this healthy character. To discuss this matter would lead us too far from the subject in hand, and is a matter to be followed out upon some other occasion.

Studies like these were begun ten years ago by Koch, who himself carefully tested some two hundred different substances. He then turned over the work to Behring, who has investigated half as many more. Only very recently has any statement emanated from the master or his assistants indicating that any such substance had been discovered. Recent utterances of Koch imply that he thinks he has at last found it, at least so far as animals are concerned, and he there publicly

announced that he was ready to begin experiments with pa-
tients. His results remain to be heard. If he has been as
careful and reliable in this work as in everything else which he
has undertaken, we are on the eve of a fresh era in thera-
peutics.

The writer wishes here to express his personal indebtedness to Dr. Behring, of
the Hygienic Institute in Berlin, as well as to his brochure "Ueber die Bestimmung
des antiseptischen Werthes chernischer Präparate," etc. *Deutsche med. Woch.,*
1889, Nos. 41, 42, 43.

Experiments With Pyoktanin.

Applying now this method to present purposes permit me
to report some investigations which I made last summer rela-
tive to one of the most recent candidates for bactericidal
notoriety. During the meeting of the German Congress of
Surgeons, (1890) there was exhibited by the Darmstadt house
of Merck, a new antiseptic for which such claims were made as
to stamp it—allowing for their truth—as a most important ad-
dition to the already large list. It was acknowledged and ad-
vertised to be an aniline derivative, but beyond this, at that
time, nothing was told us of its *constitution* and its fanciful
name, which had been protected, was calculated to reveal
nothing. The improbable claim was made for it that
it was capable of healing existing inflammations, and es-
pecially in wounds and ulcers. Also that it was per-
fectly innocuous, while its bactericidal properties were lauded
as excelling those of sublimate. Along with circulars extoll-
ing its worth were sent out the brochure of J. Stilling, entitled
Anilin-farbstoffe als Antiseptica, published just before the Con-
gress. Something of his views may also be gathered from the
following statements taken from a paper by Stilling, published
in *Merck's Bulletin* (N. Y.) of June, 1890:

I have discovered that certain groups of colorific *coal-tar derivatives* possess
all the properties to be demanded of *a really good medicinal disinfectant*, which
shall not alone prevent infection, but which must also be charged with the task of
successfully combating ready-developed purulent processes; and that almost all the
known pathogenic micro-organisms—anthrax bacilli and pyococci(pus-cocci)foremost
among them—readily accumulate such colorants within their own bodies, just as

larger plants do, and succumb to their toxic agency.   Anthrax bacilli, pyococci, etc.,
as may be readily observed by the microscope, imbibe those colorants like a sponge;
so that the bacteria may be noticed as being already deeply dyed before any of the
colorific liquid itself becomes discernible in the field of vision; and the moment the
intensive coloration is accomplished, every swarming motion ceases: the cell dies!

Although the specimens then exhibited were not allowed
to be distributed, Herr Merck kindly sent me from Darmstadt
some samples of the various preparations of pyoktanin which
he was preparing for the market. With these, I at once began
a study of its value, working along the lines already laid down
in the earlier part of this paper, and with the kind advice and
assistance of Dr. Behring.

Pyoktanin is furnished in two   colors, *blue* and *yellow*, of
which the former is much the more soluble.   Of each of these
a 1 to 1,000 solution was made.

In the following tables where a growth was fouud it is so
indicated by the sign $+$, while the failure to grow or to de-
velop is indicated by $—$.

I.   Hanging drop cultures (bouillon) of anthrax, with yellow pyoktanin, at 37° C.

	IST DAY.	3RD DAY.
Control	$+$	
1-7,000	$+$	$+$
1-3,500	$—$	$+$
1-1,400	$—$	$—$
1-700	$—$	$—$
1-500	$—$	$—$

II.   Ditto with staphylococcus pyog. aureus.

	IST DAY.	3RD DAY.
Control	$+$	
1-7,000	$+$	
1-3,500	$+$?	$+$
1-2,500	$—$	$+$?
1-1,400	$—$	$—$
1-700	$—$	$—$

III.   Ditto with streptococcus pyogenes.

	IST DAY.	2ND DAY.
Control	$+$	
1-7,000	$+$	
1-3,500	$+$	
1-2,350	$+$?	$+$
1-1,750	$—$	$—$

IV.   Hanging drop cultures of anthrax, in *serum*, with yellow pyoktanin, at 37°C.

	1ST DAY.	2ND DAY.	3RD DAY.
Control	+		
1-7,000	+		
1-3,500	+		
1-2,350	?	+	
1-1,750	—	?	+
1-1,200	—	—	—

.   Ditto, with staphylococcus aureus (calves serum).

	1ST DAY.	2ND DAY.
Control	+	
1-7,000	+	
1-3,500	+	
1-2,350	?	+
1-1,750	—	—

These experiments were all made with the yellow pyoktanin. Similar work with the blue variety showed that it was more active, nearly doubly so, in fact.   It is unnecessary to give the tables here after this statement.

Spore-thread cultures were next made, of which the following table will serve as a sample:

VI. Spore-thread cultures of anthrax (hanging drop) in bouillon, with blue pyoktanin, at 37° C.

	1ST DAY.	2ND DAY.	3RD DAY.
Control	+ .	Spores.	All spores.
1-80,000	+	+	
1-40,000	+	+	
1-20,000	—	+	+
1-10,000	—	—	+
1-5,000	—	—	+
1-3,500	—	—	—

Next a series of tubes of agar were impregnated with various proportions of yellow pyoktanin and cultures were attempted with the following results:

VII. Cultures of anthrax in agar, with yellow pyoktanin in proportions following , after 48 hours, at 37° C.

Control	+	
1-20,000	+	
1-10,000	+	
1-5,000	+	
1-2,500	+	Bacilli still abundant, only with relatively fewer spores.

VIII.   Ditto, only with staphylococcus aureus.

Control	+
1-20,000	+
1-10,000	+
1-5,000	+
1-2,500	+

As a variation of this experiment I allowed a 1-1,000 solu-
tion to stand on top of a pure culture of staphylococcus aureus
for 48 hours, then poured it off and transferred from this to a
fresh tube.   In 24 hours there was a luxuriant growth; show-
ing that even 48 hours' exposure after this fashion failed to
destroy this species.

IX.   Next 5 cc. sterilized bouillon were inoculated with anthrax and carefully
shaken.   Solution of yellow pyoktanin was added 'ill the preparation stood 1-1,400.
(This was examined after 24 hours at 37° C., and no evidences of growth were
found).

A. After 5 minutes' exposure a second tube was inoculated from this.   In this
tube *A*, after 24 hours in the thermostat, there was no growth perceptible; after 48
hours there were a few threads without spores.

B. After 2 hours a third tube was inoculated.   In this, after 48 hours, there
was no growth.

C. After 24 hours a fourth.   In this, after 48 hours, no growth.

X.   Same, except with staphylococcus aureus.   In the original tube, 1-1,400, after
24 hours there was abundance of zoöglœa masses.

A. (5 minutes).   In 24 hours rapid growth.

B. (2 hours).   In 24 hours abundance of single cocci; in 48 hours zoöglœa
masses.

C. (24 hours).   After 48 hours abundant growth.

XI.   Same, except with streptococcus pyogenes.

A. In 24 hours slight growth, which after 48 hours became abundant.

B. After 24 hours nothing; after 48 hours evident growth.

C. After 48 hours nothing.

XII.   Streak cultures of anthrax on agar, with yellow pyoktanin in following pro-
portions, after 48 hours in thermostat at 37° C.

Control	Typical growth.
1-2,000	Growth, but not so rich.
1-1,000	Limited growth.
1-750	Still more restricted.
1-500	Perceptible only along the streak and in good light.
	In the condensation water in the tube bacilli ap-pear to have grown with considerable freedom.

XIII.   Ditto, but with staphylococcus aureus.

Control	Typical growth.
1-2,000	Same.
1-1,000	Same.
1-750	Limited growth.
1-500	Only slightest appearance at isolated points.
	In the condensation water cocci have multiplied, but not in abundance.

The last results noted in XII and XIII would seem to imply that the agar holds the material and that the condensation water had lost its proportion of the same.   Numerous coagula or flashes in the agar were more deeply stained and may have taken up an undue proportion of the dye by selective affinity.

XIV.   Experiments to determine absolute toxicity.

For this purpose a solution of 1-100 of yellow pyoktanin, since, this being weaker than the blue, if this were absolutely toxic the other could be considered more so.

a. A rabbit weighing 1200 grams received 0.03 in the abdominal cavity (in 3 cc. water).   At the same time under its skin 0.03 more;—*i. e.*, in all 0.06, $=^1/_{16}$ gram. This was equivalent to one twenty-thousandth of its weight of the drug.   This produced temporary toxic symptoms, from which it recoved with apparent difficulty.

b. A second rabbit of same weight received three times the same amount, say one seven-thousandth of its weight, and died in a few hours.

c. Two white mice, weighing each 15 gr., received $^1/_4$ cc. of 1-100 solution, in abdomen; *i. e.*, one six-thousanth of their weight, or only one-fourth of what they should receive providing they could tolerate the drug in proportion of 1-1500.   One died in $1^1/_2$ hours; the second barely recovered.

d. This second mouse, three days later, received a second dose of one three-thousandth of its weight under the skin of its back; it died soon after.

e. A mouse received one three-thousandth of its weight subcutaneously.   Twenty hours later, having apparently recovered, the dose was repeated, after which it soon died.   Two others received, each, one six-thousandth in the back; 24 hours later one was in condition of tremor and spasm and soon died, while the other was less affected, but died after some 40 hours.

f. Another mouse received one twenty-five-thousandth of its weight, and, 20 hours, appeared recovered; then it was given a three-thousandth more, and soon died.

g. Another mouse, which received one fifteen-hundredth of its weight, subcutaneously, died very quickly.

From all of which it appears that yellow pyoktanin must be present in strength of at least 1 to 1,500 before it can be considered an antiseptic, and the solution must be even stronger than this to prove reliable.   Furthermore, that in proportions in which it can be considered relatively toxic, *i. e.*, to bacteria, it is absolutely toxic to animals;—which facts relegate it to a very low position among antiseptics, and seem to disprove all claims as to its great merits.   I did not long pursue my inves-

tigations concerning the blue variety, since it was quickly found that it gave scarcely any different results from methyl violet and some of the other aniline dyes, which had been already tested in the Berlin laboratory, and found not to be at all reliable when in weaker proportions than 1·3500 or thereabouts.

Moreover it has since appeared that blue pyoktanin is nothing but methyl violet free from arsenic, or chemically pure, while the yellow variety is merely one of the yellow aniline derivatives freed from deleterious admixture. The protection of these substances by trademark, and the secrecy observed on their introduction, would therefore appear to be merely a trade subterfuge.

I have been lead to detail my experiments with the material not merely as illustrative of a method, but because numerous articles have recently appeared with reference to it, in some of which the writers appear to have allowed their verdicts to be influenced by what the manufacturers have claimed for it rather than by anything like a scientific test of its genuine value.

I would not wish to be understood as inveighing against a certain well-known value which most all of these aniline preparations have in common. In 1872, Dr. Chas. Curtman, of St. Louis, made known the fact that they possess antiseptic properties, and common experience has since confirmed his statement. Stilling has gone so much further as to assert that they are absolutely non-poisonous, a statement which is far from justified by facts. Behring has pointed out the remarkable correspondence between them all, that their absolute toxicity is four or five times as great as their relative toxicity, or their antisepticity, which is corroborated by my own results given above. *In fact this is true of well nigh every antiseptic tested;* and though reactions between a given substance and a particular species may show, now and then, wide variations, the general statement is beyond controversy. Indeed we see the same thing in other directions; thus (*vide supra*) anthrax bacilli will not grow on blood-serum from the rat, and Metschnikoff's vibrio can scarcely be planted in the blood of living mammals, though pigeons succumb in a day or two.

Referring back to our particular subject I would like to quote from Stilling's paper (loc. cit.) the following directions for its use in surgery and ask you to contrast them with the results of experimental tests.

The surgical antiseptic methods by means of *Pyoktanin,* I conceive to be carried out as follows: The instruments are to be simply well cleaned; or, if extra caution be desired, to be steeped, for some time preceding the operation, in a weak solution of *Pyoktanin,*—say about 1:10,000 or 1:20,000. After the operation, the wound is to be washed with a somewhat stronger solution of the same,—say 1:5000 to 1:2000. The needful stitching is to be done with silk impregnated with a 1:1000 solution of the same. Finally, the dressing of the wound would consist of antiseptic cotton and antiseptic gauze, also prepared by steeping in a 1:1000 solution of the same medicament. Thus prepared dressing materials are not only reliably *aseptic,* but also reliably *antiseptic,* and even *disinfectant;* for the slightest *secretion* of fluids within the territory of the operation must at once cause an *absorption* of a sufficiently concentrated solution of the *Pyoktanin.* Purulent developments in *puncture-channels* ought certainly not to be possible under this prophylactic *Pyoktanin* treatment.

I have no hesitation in asserting that even the blue pyoktanin —the stronger—can not be relied on in strengths above indicated for purposes claimed.

Another kind of claim was made for the material, which includes its stimulating and other desirable properties, by which it is expected to subserve useful clinical purposes. As an injection in gonorrhœa, I have had no experience with it, but find that most of those who have tried it have met with disappointment. Upon granulating surfaces it does appear to be stimulating and to exert a desirable effect, but no more so than other substances within easy or easier reach, and its stain is often undesirable. In ophthalmological practice it appears also to have scarcely come up to the requirements of the day. On the whole, then, it has but few qualities by which we are to commend it above numerous other drugs of its general class, while in all that may answer to the more scrupulous demands of aseptic surgery it has proved in my hands—as in those of others who have tested it from the purely clinical standpoint—disappointing.

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EDITORIAL ARTICLES.

KAREWSKI ON THE SURGICALLY IMPORTANT SYPHILOMATA
AND THEIR DIFFERENTIAL DIAGNOSIS.[1]

The inconstant and changing picture of constitutional syphilis,
says the author, is especially characterized by the fact that the patho-
logical phenomena produced by it show similarities with a host of
affections, which the physician has always to consider, in order that, in
individual cases, the patient be not exposed to severe injuries.   Not
very infrequently the question will present itself to the surgeon whether
to destroy or remove organs important to both life and function, in
cases where energetic antisyphilitic treatment might bring about a per-
fect recovery.   There is, indeed, hardly a branch of surgery in which
the possibility of the presence of syphilis is not to be considered.
The diseases of the joints, as well as those of the bones, especially as
far as they concern chronic inflammatory processes, the ulcerous and
lupous destruction of the skin, but above all the tumors, which form
such an extensive field for operative surgery, are to be mentioned
here.   The relation of syphilis to tumors has always, and particularly
recently, excited the interest of surgeons, as a large number of tu-
mors, which most frequently are surrendered to the knife, resembles so
much certain products of syphilis that even a post-mortem or micro-
scopical examination does not admit of a definite conclusion.   The
practical importance of this is not to be underestimated, as just the
malignant neoplasms go to make up the greatest number of these cases,
and these, again, it has been found, arise by preference at the seat of
predilection of the syphilitic neoplasm, viz., in the muscles, mucosa,
testicles and, although less frequently, in the mamma.

[1]Berliner Klinik, heft. 18, 1890.

The author speaks of the pathology, macroscopic and microscopic appearances of the syphilomata and, also, mentions some general points of differential diagnosis between syphilomata and other tumors. He then describes the syphilitic tumors of the different parts of the body, beginning with :

I. *The syphilitic tumors of the muscles.*—Confounding syphiloma of this part of the body with other tumors may become very serious,as the latter are usually of a very malign character and therefore require prompt and extensive surgical interference for their removal. Many surgeons have removed important structures with the mistaken "malignant" tumors, and finally found out that they had operated on gummata. Such cases are reported by Sidney Jones and Bier. Many less serious operative procedures might have been avoided by a correct diagnosis." It was formerly thought that a syphilitic tumor of the musculature was a rare affection. This view was the principal cause of errors in diagnosis. Sarcomatous primary neoplasms are, on the whole, rare in this part of the organism, whilst the reports of the occurrence of syphilo · ma increase steadily. It has been found in all muscles of the trunk, as well as those of the extremities. Its seat of predilection is the sterno-cleido mastoid, which was attacked in nearly one-third of all observations.

The shape of the tumor is different according to whether diffuse myositis or the development of circumscribed gummata be in question. The former process is expressed by a uniform increase in the size of the muscle, which may attain three times its original size ; the latter process is associated with the formation of roundish tumors of the size of a dove's to that of a stork's egg and even larger. Moreover, both conditions may be combined, if circumscribed nodes develop within fibrous formations, and then nodous growths will result. Their consistency is tense, elastic, sometimes softer, at other times of an extreme hardness. Their consistency will be elastic or soft if recent quickly-forming tissue predominates, and hard if fully-developed connective tissue be present. There may also exist fluctuations, if a necrotic process has taken place, which has been observed to occur spontaneously, as well as after traumatism. The skin covering the tu-

mor is, in most cases, displaceable and unchanged. If suppuration
sets in then the skin may become adherent to the tumor, inflamed and
eventually perforated. Very valuable for the diagnosis is the peculiar-
ity of the syphiloma to remain circumscribed in the affected muscle.
In spite of the enormous size which these tumors sometimes attain,
they hardly ever show a tendency to extend over to another muscle.
Two and more nodes may appear in the same muscle, or such may be
present simultaneously in isolated groups, but the anatomical limit is
never overstepped; regional degeneration, as in malignant tumors, do
not occur, and the affected part can be distinctly differentiated from
the surroundings. This fact seems to be the only typical characteristic
of the syphiloma. Some authors emphasize the absence of symptoms,
others mention violent neuralgias. Karewski, himself, had occasion
to observe all varieties of symptoms, from slight abnormal sensations
to the most violent attacks of pain, from the absence of any func-
tional disturbance to severe contractures. Of importance in the
differential diagnosis are the nocturnal exacerbations of the
symptoms. The size of the tumor has no influence on the severity of
the symptoms. Traumatism has an aggravating influence. Syphilitic tu-
mors of the musculature may, if they do not undergo necrosis, exist
for years. Their prognosis is favorable if recognized in time, and they
are absorbed quickly under antiseptic therapy. A much more unfavor-
able exit will result if operative measures be employed, through false
diagnosis. Besides the above mentioned points of differential diagno-
sis the following affections and differential points, according to the au-
thor, should be kept in mind, with which syphilomata of the muscula-
ture may be confounded; viz., in the first place sarcoma, then the
other tumors, rheumatic indurations, actinomycosis (Bier) and the
parasitic diseases of the muscles (cysticercus, echinococcus). Primary
carcinoma occurs extremely rarely in the muscles, and then mostly in
the muscles of the abdomen as the so-called desmoid. It grows very
quickly and encroaches upon all the neighboring structures, whilst the
gumma remains circumscribed. The nocturnal pains associated with
the syphilomata should also be remembered. The writer thinks that
macroscopic examination of the tumor will reveal much more than

microscopic examination. Cysticercus is rarely observed to occur solitary in the muscles, but, as a rule, multiple; it is much smaller than most syphilomata. Echinococcus is differentiated by fluctuation, hydatid fremitus, or by exploratory puncture. The author also emphasizes in doubtful cases the employment of antisyphilitic therapy before operative measures are decided upon.

II. *Gummatous tumor of the tongue.* The author includes under this head not the diffuse syphilitic affections of the tongue (syphilitic macroglossia, etc.), but merely those pathological processes which lead to the formation of a tumor. Of surgical importance is only that stage of the formation of the tumor, which, later, may be confounded with carcinoma of the tongue. Gummata of the tongue may pass, like gummata of the muscles, through all stages, indurate and disappear. Most frequently they soften in their centres, break open and form a funnel-shaped ulcer, with excavated thickened raised edges, which has a great tendency to attack the healthy surrounding tissue, and to extend over a larger area. In general, these ulcers cause little or no pain, except some troublesome disturbance in speech and deglutition. When healing, white radiating scars, with loss of substance, result. Very characteristic for the differential diagnosis between gumma and carcinoma are the localized pains associated with the latter. The pains may, however, be absent in carcinoma and present in gumma, just as well as with the latter (gumma) we may have enlargement of the maxillary glands. If anti-syphilitic therapy gives, in such cases, no satisfactory result within 14 days, operation is indicated, for in case of cancer the favorable time for operation with prospects of success should not be missed.

Besides the confounding of syphiloma with carcinoma it may be also mistaken for tuberculosis. This is, however, rare, and the discovery of tubercles or bacilli will furnish sufficient proof for a conclusive decision.

Diffuse or semi-lateral inflammation of non-syphilitic origin (glossitis and hemi glossitis) will be differentiated by the acute course of these

affections, and the involvement of certain nerves. Actinomycosis will be excluded by the absence of the actinomycosis-granules.

Everything which has been said in regard to the formation of tumors of the tongue, holds good, also, for those of the lips, which, as has been recently emphasized by Esmarch, are not rarely of syphilitic origin.

Another seat of predilection, next in degree to the muscles, for syphilitic tumors, is:

III. *The testicle.*—The syphilitic neoplasms of the testicle develop gradually, at first presenting localized hard nodular spots, and later affecting the entire parenchyma of this organ. Their form is roundishly oval, simulating the original shape of the testicle. They are, in recent cases, of an elastic consistency, but later become hard and cartilaginous by sclerosation of the newly formed connective tissue. In the later stages the tumor is entirely painless, and this indolence is regarded as characteristic for the differential diagnosis. In the earlier stages there may be no pain, little pain, or very severe pain upon pressure. The spermatic cord and the epididymis remain, as a rule, unaffected. The course of the disease is exquisitely chronic, extending over years. Very rarely is its development acute. Syphilitic disease of the testicle may be unilateral, as well as bilateral. The latter is, according to Kocher, usually the case. Syphiloma of the testicle may be confounded with tuberculosis and cancer. Regarding tuberculosis—this begins always in the epididymis, and develops for a long time only here, rarely encroaching upon the testicle itself. Just the opposite is the case with syphiloma. The size of the tumor comes also into consideration. Syphilitic disease produces large and smooth tumors, while tuberculosis is marked by small, especially irregular, nodulous tumors. Also the participation of the spermatic cord and the prostata in tuberculosis is an important point in the differential diagnosis. Finally, in tuberculosis, suppuration is the rule, whilst in syphilitic diseases this is rare. The differentiation of syphilitic from malignant tumors of the testicle is, at times, very difficult, as just such persons who have had syphilis are often attacked by malignant tumors

(Kocher). The course of the two processes is similar, but necrosis appears much more frequently in cancer, and the pains in cancer are of a severer nature. In carcinoma, also, secondary cancer-nodes will be discovered. The epididymis and spermatic cord remain unaffected in syphilitic tumors, but are attacked in carcinoma of the testicle. In cases where the differential diagnosis is very difficult, and where extensive caseation of the organ has taken place, the author advocates extirpation.

The rarest and least known syphiloma is that of:

IV. *The mamma.*—According to Billroth, so rare are the descriptions of this, that he thinks it impossible to give a clear view of this form of disease. The author limits himself to the circumscript form. This, according to Lancereaux, develops more frequently in women than in men. It consists, in the beginning, of a small node, increases rapidly, within four to five weeks, in size, is uneven and nodular to the touch, and of elastic soft consistency. The tumor very soon undergoes necrosis, which is marked by deeply-situated fluctuation and sympathetic affection of the skin. The latter becomes adherent to the tumor, reddens, gets thinned out, and finally is perforated. The tumor causes little or no pain at all, and after ulceration has taken place it does not increase in size, but collapses after its contents have been emptied. The glands of the axilla are not as extensively involved as in carcinoma. Syphiloma of the mamma, may, therefore, only be confounded with fibro-adenoma, sarcoma and carcinoma in its initial stages. Syphiloma distinguishes itself from fibro-adenoma in that it grows very rapidly, is painless, and very soon undergoes softening. Adenoma also appears chiefly at puberty, between the 16th and 25th year, and rarely is of large size, whilst syphiloma may, within a few weeks, reach the size of an apple.

The differential diagnosis of carcinoma may become more difficult, as this may increase very rapidly in size without pain, and, also, is of soft consistency. The early presence of a node in the mamma and sympathetic affection of the axillary glands will easily lead to the right diagnosis. Regarding carcinoma, the slow development of the tumor, the involvement of the axillary glands, the characteristic appearance of

the skin, the retraction of the nipple, and the adherence to the pec-toral fascia, will prevent a wrong diagnosis.

At the end of his work the author says, in regard to the therapy of the syphilomata, that they require the general therapeutics of syphilis, but, under certain circumstances, may necessitate operative procedure. He emphasizes the importance, in even obstinate cases, of the iodide of potassium and mercury. The most efficacious treatment, he thinks, is the combination of both—local inunction with mercury and large internal doses of iodide of potassium.

ALBERT PICK.

REVIEWS OF BOOKS

DIE SPECIELLE CHIRURGIE IN FUNFZIG VORLESUNGEN. Ein Kurzgefas -
stes Lehrbuch f. Aerzte und Studirende von DR. ED. LESER. Erst e
Abtheilung. Jena, Gustav Fischer; 1890; New York, G. E.
Stechert; St. Louis, J. H. Chambers & Co.

LECTURES ON REGIONAL SURGERY. A Short Text-book for Students
and Physicians.

In many cases where a certain number of scientific ideas and methods
of practice in surgery have been united, into what may be called a
school of surgery, the founder of the school has left no text-book as an
embodiment of all his teachings. In these cases it devolves upon his
pupils to collect and edit them.

The interest which attaches the general reader to the present volume
appears to the present writer to be principally a local one; in it one
may find many of *von Volkmann's* views and methods set forth, as well
as those emanating from neighboring towns, the author having been
assistant at the surgical clinic at Halle during eight years. Neverthe-
less the work appears narrow, which, however, may be due to the
endeavor of the author to encompass the whole of special surgery in
two octavo volumes of about 450 pages each. The work is more
remarkable for what has been purposely omitted than for what has been
taken up.

Thus in speaking of the treatment for hæmorrhoids the author gives
two methods only: The clamp and cautery, attributed to von Langen-
beck, and the injection of the nodes with pure carbolic acid, which is
attributed to Lange of New York.

Gynæcological operations are not considered. The German litera-
ture is frequently referred to, but scarcely any other.

W. W. VAN ARSDALE.

THE SUPPOSED CURATIVE EFFECT OF OPERA-
TIONS *PER SE.*

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FOR some time I have had the idea of collecting and ana-
lyzing the various cases recorded in the journals and
elsewhere in which intelligent surgeons, having operated for
the relief of symptoms depending upon a supposed pathologi-
cal basis, have found no such condition, and yet the patient re-
covered not only from the operation, but from the original
ailment. My attention was first directed to this subject by
reason of my experience (which I shall presently summarize)
with the operation of trephining for so-called traumatic epi-
lepsy, but the investigation begun in that line finally came
to include all such cases as I have just described. I shall
consider, *A:* The recorded cases, and *B:* The possible explan-
ations of the phenomenon observed.

A: It has been very difficult properly to classify the cases
in question, but, roughly speaking, they may be divided
into three groups in accordance with the anatomical seat of
the symptoms or of the supposed disease. This will bring
them under the following heads: I. Operations for the relief of
nervous phenomena, as epilepsy, insanity, paralysis, etc. II.
Operations for abdominal and pelvic disorders, as peritonitis,
tumors, etc. III. Miscellaneous operations.

They may be again divided into (*a*) Those in which nothing
whatever was found explanatory of the symptoms. (*b*) Those
in which some departure from normal conditions was ob-
served, but was so slight as to be apparently inadequate to
explain the symptoms. (*c*) Those in which an apparently
grave and irremediable condition was disclosed by an explor-
atory operation, but notably improved or altogether disap-
peared after mere inspection or handling, no further surgical
interference having been thought justifiable.

OPERATIONS FOR VARIOUS CEREBRAL SYMPTOMS, CHIEFLY EPILEPSY, IN WHICH LITTLE OR NOTHING WAS FOUND TO ACCOUNT FOR THE SYMPTOMS, BUT EITHER MARKED BENEFIT OR CURE FOLLOWED. TABLE I.—TREPHINING.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result.—Time between Operation and Report.	Remarks.
J. Lucas Championnière.—Jour. d med. et de chir., prat., Paris, 1888, 296.	40 M.	Fell at age of 14 years; left painful spot on head. Had convulsions (epileptoid) and for 2 years great pain in head and vertigo.	Trephined.	Nothing abnormal; dura slightly adherent.	Cured.	Immediate cessation of pain and vertigo which did not return.
"	45 "	Blow on head from hatchet at 8 years; no symptoms until 41. Since then, excruciating pains in left side of head. Tenderness in spots over head.	Trephined May 3, '86. Again Jan. 26, '87. Again July 1, '87.	No lesion found. No lesion.	"	Pain at that spot ceased, never to return. Pain at first disappeared, but returned again. Greatly improved.
"	35 "	Fell 3 months ago. Great pain in head ever since.	Trephined Aug. 19, 1884; again March 24, 1887.			Temporary relief; 2 months later vertigo returned. Complete relief for one year; later, vertigo returned, but was not troublesome.
"	"	Blow on head 2 months ago. Since then, pain at point of injury, vomiting a d vertigo.	Trephining.	No sign of fracture of skull.	Cured.	Complete relief which has been permanent.
"	29 "	Recent contusion median line of head. Pain at middle of both parietals.	Trephined.	No local disease could be found.	Complete cure.	
Dr. S. N. Leo.—Jour. Nerv. and Ment. Dis., N. Y., 1883, p. 271.	40 "	"Had 14 characteristic fits in 4 hours from blow received some time before (?)	"		Cured. Two years.	Fits gradually ceased; "free now for 2 years."
Mr. A. Poland.—Med. Times and Gazette, Sept. 26, 1868.	Boy.	Severe epilept form convulsions and unconsciousness following blow on head.	"		"	Recovered completely.

Reference	Sex	Age	History	Operation	Findings	Result	Duration	Remarks
Horsley.—Brit. Med. Jour., April 23, '87.	M.	4	3 to 14 fits daily; almost complete paralysis in right arm and leg, semicomatose.	Trephined; brain explored by incision.	Nothing abnormal found.	Cured.		Rapid recovery; no harm from incision of brain; no fit for 1 month, then slight ones, none since.
Thos. Oliver, M.D.—Brit. Med. Jour., Feb. 4, 1888.	"	16	Epilepsy following blow; several fits daily.	Trephined.	No disease of bone or membrane. Shortly after bone was removed, the dura began to bulge, it was incised and a few teaspoonfuls of serum containing flakes of lymph were discharged.	Cure for 6 months		No fits for 6 months, after which slight relapse, attributed to bad hygienic conditions.
Peter de Marchettis.—Quoted by Guthrie.	"		Epilepsy.	"	No disease found.	Cured.		
Marechal—Quoted by Guthrie.	"		Epilepsy of several years standing.	"	Nothing found.	"		
Alfred Poland, F.R.C.S.—Med. Times and Gazette, Sept. 26, 1868, p. 360.	"	14	Head struck by end of wooden trestle; no wound was made. Headache followed; 7th day had twitchings of muscles of hands; this continued off and on for about six weeks when he began to have fits and at times delirious and furious, and violently convulsed.	Trephining.	Everything normal. No depressed bone, no fracture, no appreciable disease of scalp bone or dura.	No Cured.	8 months.	Quite well, no more fits.
T. O. Edwards.—Leavenworth Med. Herald, 1870-1, iv, 8, p. 1.	"	47	Fell from carriage striking head; scalp wound only. Two years later, first convulsion, and continued in spite of medication.	Trephined.	Bone removed was thickened 1 to 3 lines.	Cured of fits.	Two months.	Later paralysis came on and death 4 months after operation.
Dr. Eastman.—St. Louis Med. & Surg. Jour., 1881, xl, 572.	"	28 ?	Light blow on head, stunning him for a time. One year later appeared to have apoplectic fit, leaving hemiplegia. Fits increased in spite of all the treatment; as many as 16 or 18 daily.	"	Small external depression was found on same side of head as paralysis, supposed to be seat of blow. Trephined head; nothing abnormal found.	Cure.	Eight years.	Paralysis cured in 2 or 3 weeks and in 2 or 4 months entirely well. Never had a fit since.

TABLE I.—CONTINUED.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result. — Time between Operation and Report.	Remarks.
Benj. W. Dudley.—Transyl. M. J., '28, i, p. 19.	Middle age M.	Blow on head 15 years ago; intellect impaired; fits began 2 years later.	Trephined.	Bone and dura normal, but dura seemed to have fluid beneath. Dressing removed on 5th day; fluid all absorbed.	Improved. Some weeks.	Result very flattering for 2 weeks, but on account of indulging a craving appetite had recurrence, but milder and less frequent.
D. B. Lees and Edw. Bellamy.—Tr. Clin. Soc., London, '80-1, '81, xiv, 12.	Boy.	Blow on head with poker at 7. One year later had fits; fits at times very frequent.	"	Bone natural but dura bulged.	Free from fits for 8 weeks.	Recurrence later.
Dr. Gay.—Bost. Med. and Surg. Jour., '82, cvi, 370.	"	Fell, striking head; no fracture; soon began to have fits, but free for 3 years. Two months ago without fresh cause began to have oppression and tenderness in cert:in spot in head. Could not sleep.	Trephining	Bone and dura both normal.	Cured. Eight mos.	No fits since operation.
Mr. Bryant, reported by J. T. Dickinson —Bost. M'd. and S. Jour., '73, i, 799.	16	Epilepsy 4 years. Fell, striking head, causing scalp wound only.	"	Skull thickened; one-fourth inch at superior border; five sixteenths inch at inferior border.	Much improved. Four months.	Free from fits unless some unusual cause may excite a slight one.
Editor's Table.—San Francisco M. Press, '60-1, ii, 225.	28 ?	Injury on head 7 years ago. Mental faculties nearly destroyed, right arm nearly paralyzed and leg weak. Fits since injury, and unable to follow his work.	"	Inner table of skull normal and not at all depressed.	Much improved for a time. Some weeks.	Free hæmorrhage from scalp. Patient much improved at once. 7th day, secondary hæmorrhage arrested only by deep stitches through flaps. This caused old symptoms to return. Bleeding continued for 3 weeks. Patient best at times of most bleeding. One week after, hæmorrhage stopped, patient relapsed in former condition.

Reference	Sex	Age	History and symptoms	Operation	Bone and dura	Result	Duration	Remarks
Dan. Ayres.—Trans. Brooklyn M. Chir. Soc.; Med. & Surg. Reporter, Phila., '61, vi, p. 356.	M.	9	Ten months before struck with stone on right frontal eminence causing lacerated wound; symptoms of concussion. In 2 months change in disposition. Spells of violent temper and petit mal.	Trephined	Bone and dura appeared absolutely normal.	Cure.	Four and a half months.	Convulsions only on 3rd or 4th days [nurse had wrongly given him full diet.] Regained former disposition.
J. H. Wharton.—Dublin Hosp. Gazette, '59, n. s. vi, 202.	"	35	Fell from wagon on head, Fits, intense pain in head, giddiness staggering.	"	Bone normal.	Relieved.	Four weeks.	No fit while in hospital, after operation, 4 weeks. Pain relieved at once, when button was removed.
Jas. F. West F.R.C.S.—Med. Chir., Tr., '79, Lond., 1880, lxiii, p. 23.	F	14	Struck on forehead by stone. Become drowsy and forgetful; less intelligent Fits for past year. Fit 4 days before operation, and has not spoken since. Urine and faeces passed involuntarily.	Trephined over slight depression.	Button showed depression of outer table and compression of diploe. Inner table bore no evidence of fracture.	Improved	Two years.	Mental condition improved and free from fits.
T. G. Richardson.—New Orleans Jour Med., '68, xxi, 494.	M.	12	Struck in middle of forehead; no fracture. Fits for several months. Cerebral functions slow and uncertain; stupid.	Trephined.	Disc of bone appeared perfectly normal and so did dura, to Dr. Richardson, but Prof. Stone thought it a little opaque and thickened, Serum in arachnoid which burst through scratch in dura.	Cured.	Two months.	No spasms after first night.
W. Stone.—New O. Med. and Surg. J., '58-9, xv, 433.	"	53	Frequent fits some months.	"	Nothing found, but relieved of fits for a time. Trephined again and had no fits for a year or two.	Improved.	One to two years.	After second trephining no fits for 1 year, then recurrence A third operation revealed dura much thickened and firmly attached.
Saxtorph.—Jour. de méd. et de chir. prat., '82, p. 163.	F.	20	Healthy. Slight bump on head, skin not broken. Nine months later first fit; recurred with frequency. Medical treatment of no avail 21 months later.	Trephining.	Operation area sensitive, nothing pathological found. Antiseptic dressings.	Cured.	3 weeks.	
Sayre.—M. and S. Rep., '61, vi, 358.	M.		Blow in occipital region, followed by epilepsy which resisted all medical treatment; confirmed epileptic.	Trephined	Everything absolutely normal.	Cured.	Almost one year.	

TABLE I.—CONTINUED.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result.—Time between Operation and Report.	Remarks.
Dr. Andrew Otterson. Case of Dr. Buck.—M. and S. Rep., '61, vi, 358.	M.	Epilepsy following injury.	Trephined.	Everything normal.	Cured.	Remained well "long time."
Louis Bauer, M.D., M.R.C.S., St. Louis Med. and Surg. Jr., '70, n. s., vii, 205.	26 "	Struck anteriorly to right parietal protuberance with axe. Scalp wound. Two years later epileptic fits, several daily.	"	Not slightest evidence of previous injury; dura also healthy.	Cured. Two mos.	Before operation mind impaired. Muscular power below par; left leg weaker. To all intents and purposes patient completely cured, both of epilepsy and other cerebral symptoms; can walk and run.
Morel of Besancon.—Quoted by Guthrie, Injuries of head affecting brain, p. 82.		Epilepsy for 6 months.	Trephining.	Nothing abnormal.	Cured.	
"		Epilepsy for 12 months.	Trephined.	No disease found.	"	
M. Walther.—Quoted by Guthrie, Injuries of head affecting brain, p. 82.	36 "	Blow on head from stone.	" "	Nothing abnormal found.	"	
Lewis A. Stimson.—Personal communication.	Adult. F.	Fell from second story window; became insane and remained so several weeks.	" "	Nothing found.	"	Recovered senses in a day or two and discharged cured.
Guthrie.—Injuries of head affecting brain, p. 86.	"	Fixed pain in head following blow; gradually lost power of right arm and leg; arm became rigid, vision and hearing imperfect, memory affected.	Trephined and explored brain 1882-81.	Bone and dura both free from disease.	"	In 3 days paralysis had disappeared, sight and hearing became normal and she left, cured.
Referred to by Wm. Pepper.—Dr. J. Forsyth Meigs', Penn. Hosp. Rep. vol. ii, '69, p. 181.	Lad. M.	Epileptiform convulsions and unconsciousness following blow.	Trephined.	No discoverable lesion of bone or dura.	"	

Reported by		History	Operation	Findings	Result	Duration	Remarks
Rhodius.—Quoted by Guthrie.		Fixed pain in head from blow.	Trephined.				"Cured after several years of great suffering."
M. Bouchery.—Quoted by Guthrie.		Dull pain in head add hemiplegia.					In 56 days patient was quite cured.
D. S. N. Leo.—Am. Jour. Neurol. and Psych., vol. ii, '83, p. 36.		Two cases. Epilepsy.	Trephined 3 times.	Nothing abnormal found.	Improved.		Both cases benefited and resumed work.
Andrew Blake, M.D., M R.C S.; London M. and Phys. Jour., '86, iv, 103.	M.	Blow on right parietal bone with fist; no division of integuments. Persistent headache; epilepsy and left hemiplegia.	Trephined.	Skull thick; but little adhesion of dura; no irregularity.	Cure.	Several mos.	Paroxysms at once mitigated and ceased altogether in a few hours, and regained power in left side in less than a month.
Dr. Kirkwool.—Br. Med. Jour., Lond., '78, ii, 55.	16	Four years ago fell and was stunned. Character changed and 2 years later had fits.	"	Skull and cortex entirely normal.	Improved weeks.	Few	Fits decreased in frequency. Trephined again and fits still further decreased, but temper worse.
Mr. Whitehead.—Br. Med. Jour., '86, i, 19.	28	Fell in quarry and sustained fractured skull (compound.) Constant headache, and for 7 weeks epileptic fits.	"	Nothing abnormal was observed.	Cured.	8 months.	Only 1 fit since operation, and free from headache and depression.
W. J. Van Eman.—Kansas City, '85, vi, p 470.	50	Fell under wheel at 12 years of age; wheel passed over head. Thirty-four years later fit. Six months later 2nd, etc. Depressed cicatrix; fits for 4 years.	"	Pericranium perfectly healthy, as was also the dura. A little apparent thickening of bony wall.	"	1 year.	Had bromides before and after operation.
D. Macdonald.—Jour. Neurol. and Ment. Dis., N.Y., '86, n s. ix, p 488.	24	Fell down stairs at 6 years of age. Fits began at 16 years. Attacks nocturnal, but evidenced by bitten tongue, etc.	"	Inner surface of bone smooth and non adherent, and dura not wounded.	"	"	
Reported by A. H. Bennett. Operation by Mr. Gould.—Br. Med. Jour., '87, i, 12.	36	Blow on head 6 years previously; fits ever since, averaged one per week.	Trephined Aug. 25, 1885.	Portion of bone removed was perfectly normal, as was also the dura a circular portion of which was incised. Cortex was normal and exploration in 3 directions 1 inch revealed nothing.	Cured.	5 months.	No fits since operation.

TABLE I.—CONTINUED.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result. — Time between Operation and Report.	Remarks.
Agnew and White. Case Book.	42 M.	Fell from horse during war. Fits began some time after. Increasing in severity. Occasional maniacal spells. Scar over left parietal region.	Trephined.	Nothing abnormal.	No fits for 3 months. Then 2 in close succession. Then none for 7 months. Ten months.	In all these cases of Dr. Agnew and myself the bromides were given in moderate doses after the operation; but in all of them the bromides had signally failed before the operation was attempted.
"	23 "	Blow on head from blunt weapon during a fight.	"	"	Cured. ? 18 mos.	No fits for 18 months.
"	13 F.	Wound of scalp from fall against a clay flower pot at age of 4 or 5, followed by epilepsy and gradual mental failure. Imbecile at time of operation.	"	"	Relieved. 3 mos.	No fits, although previously they were of daily occurrence. Patient regained intelligence enough to give notice of her desire to evacuate bladder or bowels, acts which she had performed regardless of time or place before the operation.
"	29 M.	Wound of scalp and supposed fracture from brick falling on head from a height, ten years previously.	"	"	Cured. ? 2 years.	Fits appeared 3 years after accident; were increasing in number and severity. Averaged 1 in a week or ten days. None for 2 years after operation.
"	30 "	Scalp wound with apparent depression.	"	"	Relieved. 4 mos.	Fits before operation averaged 4 or 5 weekly. After operation 1 at end of 3rd month; two during fourth month.
"	39 "	Gunshot wound of head; supposed fracture.	"	"	9 mos.	Fits before operation once in two or three weeks, but very violent and severe. After operation 1 in several weeks. One at end of 3 months.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result.—Time between Operation and Report.	Remarks.
Agnew and White.—Case Book.	34 M.	Scalp wound with supposed fracture.	Trephined.	Nothing abnormal.	Relieved 2 mos.	Fits before operation from 1-3 daily None up to time of losing sight of patient.
"	21 "	Scalp wound received at age of 11. Followed by a period of unconsciousness.	"	"	" 6 weeks.	Fits before operation very frequent and violent, sometimes 3 or 4 daily. After operation none for six weeks, while patient was in hospital.
"	23 "	Fracture and trephining at age of 15. Fits begun at 17. Increasing in number and severity.	"	"	" 11 mos.	Fits before operation 1 to 2 weekly. After operation none for four months, then 1 to 2 monthly. Still under observation.

TABLE II.—LIGATURE OF BLOOD-VESSELS.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result. — Time between Operation and Report.	Remarks.
Alexander.—Brain. London 1882, v, 178.	11 F.	Good family and personal history. Fits began five years ago without known cause. Very frequent, lately, as many as 12 in one night. Memory failing.	Left vertebral tied Mar. 1, 1882. Left vertebral tied March 29, 1882.	Alexander remarks that in the 21 cases alluded to in this paper, 3 have been quite well for nearly a year; 9 others so free from fits and for such a space of time, it may be said a cure has resulted, or is likely to result; and 8 have improved in so many respects, or are improving, that the operation would be justifiable if no better results were obtained. The one who died in a fit, was an accident.	Improved. 2½ mos.	June 5th. Improvement very decided. Only 5 fits in last 17 days, and those not severe. Stupidity lessened.
"	11 "	First fit four years ago, while at play. Nineteen fits in last seventeen days.	Right vertebral tied March 1, 1882; improved for a time, but recurred. Left vertebral tied April 26.		" 1½ mos.	From May 9th to June 5th only 3 fits. Ice bag applied to spine May 9th, and retained since. Mental condition improved.
"	23 M.	Averaged 35 fits a month. Fits since 5 years of age, brought on by fright it is alleged.	Both vertebrals tied March 29, 1882.		" 2½ mos.	Twenty fits in April, 15 in May, and up to June 6th, only 1 Ice bag to spine from May 6th. Has lost to considerable extent former stupid look.

TABLE II.—CONTINUED.

Operator and Reference	Age and Sex	Supposed Cause, Duration and Character of Fits	Operation	Conditions Found.	Result — Time between Operation and Report.	Remarks.
Alexander.—Brain. London. 1882, v, 178.	23 M.	First fit at 14 years, caused by fall; depressed scar at back of head. Wound is not much affected. Averaged 20 fits per month.	Left vertebral tied July 31, '81. Right internal carotid tied July 27.		Improved. 1 year.	Eleven fits in August, 5 in September, and up to Oct. 8, two slight ones; rest of October, 1; up to Nov. 16th, 1 and up to present, average, per month, 12. Fits milder and temper improving.
"	22 "	Fits for eleven years, caused by being beaten by his father; average number 15 per month.	Left vertebral and left common carotid tied Aug. 31, 1881.		" 4 mos.	Six fits in September, 8 in October, 2 in November, and up to Dec. 20, 2 more. Died from suffocation during a fit.
"	26 "	Fits since childhood, average 10 per month. At times maniacal as fit is passing off	Left vertebral tied Aug. 17, '81 Right vertebral tied Jan. 11, '82.		" 9 mos.	Mental condition improved and maniacal attacks disappeared. Fits lessened after first vessel was tied. 3 fits in February, 10 in March 8 in April, 6 in May; much milder.
"	29 "	Fits since 13 years of age; average 16 per month. Aura begins in right hand and arm with flexion. Limb became somewhat rigidly fixed in this position.	Right vertebral tied Jan. 25, '82. Left vertebral tied Feb. 8, '82.		" 4 mos.	Three fits in February, 7 in March, 10 in April, and 6 in May. Much milder; mental condition improved; power in arm returned.
Alexander.—Medical Times and Gazette. London, 1882, i, p. 250.	7 "	Slobbering, howling idiot. Fits begin at 20 months and have been increasing since Twelve fits in last twenty days.	Left vertebral tied Nov. 21, '81. Right vertebral tied Dec. 28.		Cure. 6 mos.	Free from fits after and operation up to middle of February; up to May 31st only 1 fit, although a very uncomfortable home.
"	17 F.	Fits for years in Dingle Mount institution; 289 fits in 1881.	Right vertebral tied Dec. 21, '81.		" 6 mos.	No fits until end of 5 months, when a paroxysm of anger caused some kind of fits; none since.

Reference	Age	Sex	History	Operation	Result	Duration	Remarks
Alexander.—Medical Times and Gazette, London, 1882, i, p. 250.	18	M.	Hydrocephalus at 18 months, and struck with ruler on head at school. First fit at 14 years. Oct. 1-12, 13 fits.	Left vertebral tied Oct. 12, '81. Right vertebra tied Dec. 8.	Cure.	2 mos	Fits reduced to one-half former number after first operation. No fits for five weeks after second operation, until news of father's death caused few slight fits; then again free for over a fortnight when he passed from observation.
"	31	F	Fits began at 2 years, following whooping cough; then ceased and reappeared at 14 years. Mother died of fits. Average 6 fits a week.	Right vertebral tied Jan. 18, '82.	Improved.	1 mo	Up to Feb. 20 had 4 fits. Refused to have other vessel tied.
F. C. Becton.—N. Am. Med. and Surg. Jour., 1827, iv, 83	22	M.	Epilepsy for over 9 years. No injury. All usual remedies tried.	Left common carotid tied.	"	10 days.	But 2 fits in ten days, being elated at prospect of cure, gave himself up to intemperance and fits returned, and doctor gave up case.
C. Angell.—N. Western Med and Surg. Jour., Chicago, '87, xiv, 446. page 447	20	"	Fits 3 or 4 years; seldom at first, but increasing in frequency and severity; 15 or 20 day of operation.	Right common carotid tied.	Died on 7th day.	7 days.	Had no fit or symptom of it after operation til death.
"	40	"	Fits for 7 years. Last 3 years were severe and frequent; almost daily; incapacitated for work; mind affected.	Right common carotid tied July 8.	Improved.	40 days.	Only 4 fits since operation; is attending to business and improved in every way.
Wm. Alexander.—M. Times and Gazette, London, 1881, ii, p. 598.	17	"	November, 1879, 16 fits; December, 1879, 4 fits; year of 1880, 183 fits; first half 1880, 147; longest period of freedom 5 weeks. Supposed to be caused by fright.	Tied left vertebral July 6, 1881.	Cure.	3¾ mos.	August 21, l-ft hospital and went to church. Excitement caused fit. Was given bromide and belladonna and put to bed. Had several up to August 29 Discharged Sept 28. Oct. 27th, has been working and no fit since July, '82, still free from fits and at business. (Later report).
"	35	"	Fell and struck head 5 or 6 years ago. A week later, had fit; more and more frequent and severe lasting 5 to 20 minutes.	Tied left vertebral Aug. 17, '81.	"	2½ mos.	Had fit after operation, and 2 next day and day after. None since. Left ulnar nerve had been stretched July 6th without effect. No fits July, 1882. (Later report).

TABLE II.—Continued.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result. — Time between Operation and Report.	Remarks.
Wm. Alexander, M D. F.R.C.S. Medical Times and Gazette. London, 1881, ii, p. 600.	9 M.	Epileptic from birth and idiotic to a certain degree. September, 1880 to June, 1881, 160 fits.	Left vertebral tied July 13, '81.		Cure. 3½ mos.	Occasional fits up to Aug. 10. None since. July, 1882, no fits since. (Later report).
Alexander.—Brain. London, 1882, v, 170.	24 F.	Menses ceased one year ago, and fits soon began. 45 daily.	Right vertebral tied Jan. 18, '82. Left vertebral tied Feb. 2.		Improved. 5 mos.	After first ligature fits continued, but milder. Vessel was small. 6 days after, second ligation, and occasional fits since. March 16, shortened round ligaments for retroversion; few slight fits. No fits after leaving hospital June 20th. Menstruation returned.
"	18 "	Fits for 5 years, following severe news of her father's death; petit mal daily; severe attack weekly.	Both vertebrals tied Feb. 15, '81.		" 4 mos.	June 6th, few slight fits.
"	25 "	Fits since 13 years of age; almost daily.	Both vertebrals tied March 23, '81.		Cured. 2 mos.	Middle of May, no fits since operation.
"	18 "	Hip disease since 6 years of age. Six months ago first fit; average, one every second day.	Both vertebrals tied Feb. 15, '82.		Improved. 3½ mos.	No fit until March 6th. Two fits in March and 3 in May. June 1st, 1.
"	25 "	Fits. Seven to twenty-seven monthly.	Right vertebral tied March 16. Left vertebral tied April 12.		" 6 weeks.	Three fits up to May 25.
"	15 "	First fit at 15 months; began at 7 years of age; as many as twenty daily.	Both vertebrals tied April 5.		Cured. 2½ mos.	April 15 and 16, two slight fits. June 20, no fits since.

Reference	Sex	Description	Operation	Result	Duration	Remarks
Alexander.—Brain, 1882. v. 178.	F.	Fits since 8 years, through fright. Fell at 11 years and cut head. After this became an imbecile and did not recognize anyone. 582 fits in 1881.	Left vertebral tied Feb. 2, '82.	Improved.	3 mos.	No fit for a week, and during next fortnight only 7. Up to May 1st, averaged 11 fits a month from 48.5, and these are lighter. Brighter looking and takes more notice.
J. R. Preston, Esq.—25 Tr. M. and Phys. Soc., Calcutta, 1831, v, 359.	M.	Severe epileptic fits every two weeks for 5 years.	Ligature of common carotid.	Cure.	1 year.	No fits since operation.
V. Mott, jr.—N. Y. Med. Gazette, 1850, i, 120.	"	Incipient epilepsy.	Common carotid tied.	"	5½ mos.	No fit since.
J. R. Wood.—N. Y. 37 Jour Med., 3 s., vol. iii, 1857, p. 22.	"	Fits for 8 years.	Ligature of common carotid.	Much improved.	6 years.	Fits lighter and less frequent. Could attend to business.
T. H. Hamilton, jr., 18 M.D.—Buffalo Med. Jour., 1846-7, ii, 119.	"	Fits from childhood; from 12 years fits became more frequent, one or two daily.	Tied right carotid Aug., 1838. Left carotid tied Mar., 1839.	Cure.	2 years.	First ligature diminished fits in force & frequency. None since second ligature.
Z. Pitcher, M. D.—22 Penins. Jour. Med., Ann Arbor, Mich., 1853, i, p. 8.	F.	Fits since 13 years old. Aura first began in right forearm, but gradually traveled up to point of omo-hyoid. At times 24 fits in twenty-four hours.	Common carotid tied below omo-hyoid.	Cure; lasting 2 yrs.	3 years.	For two years after operation, entirely free from fits, but past year, if exercise is omitted and any unpleasant mental disturbance, has petit mal, but never loses consciousness.
J. R. Brown, Ass't 22 Surgeon U.S.Army.—Am. Jour. Med. Sci., Philadelphia, n.s. xxviii, p. 415.	"	Epilepsy since 17 years old. At times as many as 24 in twenty-four hours.	Right common carotid tied June 5, 1848.	Cure.	5 years.	Relief immediate. For over three years exempt from seizure of any kind. Within past year any unusual mental disturbance may cause petit mal, but never loses consciousness and mental condition improved.

Class I.—Operations for the Relief of Nervous Phenomena.

I may begin the consideration of these cases with a brief statement of my personal experience.

During the past five years Dr. D. Hayes Agnew and I have trephined in 15 cases of supposed traumatic epilepsy. All but one recovered from the operation. In one a bullet was found imbedded in the brain substance. In another an irregular portion of the internal table was dissected out from beneath the dura mater to which it was attached by cicatricial adhesions. In another no spicules of bones projected from the internal surface of the button removed, and an adjacent thickened portion was taken away by the rongeur. In two marked thickening and sclerosis of the cranium in the region of operation were observed. In the fatal case death occurred from suppression of urine, possibly a secondary effect of the etherization. The patient was an imbecile and a confirmed drunkard as well as an epileptic, and was really not a fit subject for operative interference. His friends were notified that it was a great risk with but slight chance for improvement. In the remaining cases nothing abnormal was seen. It was the effect of operation upon these latter cases which, as I have said, led to the preparation of this paper. Without exception they were markedly improved by the trephining, in two instances even to the point of apparent cure, no return of symptoms having been observed for 18 months and two years after the operation.

In the other 7 the results were strikingly favorable, convulsions disappearing for weeks or months, although previously of more than daily occurrence. These cases are included in the table which I present herewith, which is not intended to be complete or exhaustive, but embraces, I think, an interesting variety of extraordinary results from operations which proved to have no justification in any discoverable pathological condition.

A few illustrative cases may be selected from the 154 contained in the table:

Dr. Eastman[1] reported the case of a man who sustained a light blow on the head, stunning him for a time.   One year later he had what appeared to be an epileptic fit, leaving him hæmiplegic.   Epileptiform convulsions appeared and increased in spite of all treatment, until he had as many as 16 or 18 daily.   Trephining was done, but with the exception of a small external depression on the same side of the head as the paralysis, nothing abnormal was found.   The paralysis was cured in two or three weeks, and in four weeks he was entirely well.   He never had a fit up to the last report, eight years after operation.

Sayre[2] has reported the case of a man who received a blow in the occipital region, followed by convulsions which resisted all medical treatment.   He became a confirmed epileptic.   He was trephined, and everything was found absolutely normal.   Up to the time of report, one year after operation, he seemed cured.

S. E. McKinley[3] has reported the case of a boy, æt. 16, who, after having for years been epileptic, fell through a bridge and had one testicle crushed.   It was removed and he had no fits subsequently, the last report being six or seven years after the operation.

W. H. Cane[4] has reported the case of a man, æt. 24, who had had fits for seven or eight years, averaging three times a week.   The operation of tracheotomy was performed and he had no fits afterwards, last report being four months after the operation.

Graham Fitch[5] has reported the case of a woman, æt. 21, who, at the age of 7, had fallen, striking her head.   She was unconscious for a time.   Depression in the parietal bone could be felt.   An incision was made in the scalp over the depression, one inch in length, and kept open three months.   She had one fit immediately after the operation and had none afterwards, the last report being one year after the operation

Dr. Parish[6] has reported a case of a young man, æt. 20, who struck his head against a gas-pipe.   He had a few fits for a few days after the accident, and these fits returned after eight months.   An incision

[1]St. Louis Medical and Surgical Journal, 1881, vol. xl, p. 572.

[2]Medical and Surgical Reporter, 1861, vol. vi, p. 358.

[3]American Medical Gazette, 1855, vol. vi, p. 295.

[4]London Lancet, 1851, vol. ii, p. 35.

[5]American Practitioner, Louisville, Ky., 1887, vol. xvi, p. 212.

[6]Philadelphia Medical Examiner, 1843, vol. ii, p. 799.

was made through the tender spot on the scalp and a few issue peas were introduced and retained by plaster. There had been no return of the fits up to the date of the report, two to three years after the operation.

Dr. Agnew and I have recorded the case of a man, æt. 23, greatly epileptic, who, years before, had received a blow on the head from a blunt instrument during a fight. Trephining was done, and nothing abnormal was found. He had no fits for 18 months after the operation.

We have also notes in the a case of a man, æt. 29, who had received a wound of the scalp and supposed fracture from a brick falling on his head from a height ten years previously. Fits appeared three years after the accident. They were increasing in number and severity, and averaged one in every week or ten days at the time of operation. He was trephined, and nothing abnormal was found. No fits have occurred up to the present time, two years after operation

T. H. Hamilton[7] has reported the case of a man, æt. 18, who had fits from his childhood. From 12 years the fits became more frequent, averaging one or two daily. The right common carotid was tied August, 1838, and the left carotid March, 1839. The first ligature diminished the fits in force and frequency. He had no fits after the second ligature, and remained cured up to last report, two years after second operation.

J. R. Brown[8] has reported the case of a woman, æt. 22, who had been epileptic since she was 17. At times she had as many as 24 in 24 hours. The right common carotid was tied June 5, 1848. Immediate relief followed. For three years she was exempt from fits of any kind. Then any unusual mental disturbance caused petit mal, but she never lost consciousness and her mental condition improved up to last report, five years after the operation.

The tables may be summarized as follows:

In 56 cases of trephining for epilepsy, nothing abnormal was found to account for the symptoms; 19 cases were reported in 6 months or less after the operation; 11 cases were reported from 6 to 12 months after the operation; 6 cases were reported from 1 to 2 years after the operation; 1 was reported 8 years after the operation; 25 of the above-mentioned cases were re-

[7] Buffalo Medical and Surgical Journal, 1846-7, vol. ii, p. 110.

[8] American Journal of the Medical Sciences, n.s., vol. xxviii, p. 415.

ported as cured; 18 were reported as improved. In 3 of the cases it was mentioned that relapse occurred later.

In 30 cases of ligation of blood-vessels for epilepsy, 23 cases were reported in six months or less after the operation; 3 cases were reported from 6 to 12 months after the operation; 1 case was reported 2 years after the operation; 14 of the above-mentioned cases were reported as cured, 15 were reported as improved; 1 died 7 days after the operation. The right common carotid was tied in this case, and no fit occurred after the operation.

In 10 cases of castration for epilepsy all were reported as cured; 1 case was reported 3 months after operation; 4 cases were reported more than 2 years after operation; in 5 the time when reported was not mentioned.

In 9 cases of tracheotomy for epilepsy, 8 were reported 5 months or less after the operation; 1 was reported 2 years after the operation; 2 of these were reported as cured; 6 were reported as improved; 1 was reported much improved, but died 2 months after operation.

In 24 cases of removal of the superior cervical gangliæ of the sympathetic nerve, 6 of these cases remained well at the end of 2 years; 10 were improved; 5 remained unimproved; 2 died soon after the operation, but not from its direct effects. One was not heard from.

In 6 cases of incision of the scalp for epilepsy, nothing was found to account for the symptoms; 3 of these cases were reported as cured at the end of 3 months or less; 1 was reported as cured at the end of 1 year; 2 were reported as cured at the end of 2 years; 2 other cases, almost similar, are reported as cured.

Twelve cases of epilepsy are reported as cured by such operations as stretching of the sciatic nerve, excision of musculo-cutaneous nerve, cauterization of the larynx (2), circumcision, application of a seton to back of neck (4), tenotomy of external recti, burning of scalp, puncture of heart, etc.

Thirteen cases of spontaneous or accidental cures of epilepsy are also reported at a time varying from 2 months to 5 years

after the traumatism, which was a fall, a burn, a wound, an amputation for intercurrent injury or disease, etc.[9]

Many of the cases contained in the table are, I admit, open to the serious objection of having been reported too early. I have included them, however, as the benefit following operation was so marked and unmistakable as to be worthy of investigation in spite of its possible want of permanency. Setting them aside, however, we still have left a large number of cases in which there was apparent cure at times varying from three months to three years after operation.

The explanation of these cases is scarcely to be found in the theory that some source of reflex irritation has been removed.

It is well known that in many epileptics in whom a distinct aura exists, if there be induced an interruption of nervous transmission between the skin and the nerve centres, the paroxysms are greatly diminished, or may even disappear.

Dr. Brown-Sequard[10] has collected a number of such cases in which either a diminution of the fits, or, as was more frequently the case, an entire suspension of them took place after the ligature of a limb or finger, section of one or many nerves, amputation of a limb or other part, elongation of the muscles which were the seat of the aura, or cauterization by various means of the part of the skin in which the aura originated.

For many years operations based on this fact have been performed with varying but sometimes surprising success. Billings[11] has given a résumé of a number of such cases, including cures by lithotomy, amputation of fingers and toes, nerve section, enucleation of the eye and removal of cicatrices. I have myself had four cases in which the latter operation was followed by such marked benefit[12] that it occurred to me that

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[9]Prof. H. C. Wood has told me that having noticed the cure of epilepsy in a domestic animal as the result of a serious fall upon the head from a height he subsequently produced cures in animals similarly affected by inflicting heavy blows with a blunt instrument upon the occiput.

[10]"Researches on Epilepsy," etc.

[11]Cincinnati Lancet and Observer, 1861, p. 339.

[12]In one case, a patient of Dr. Chas. K. Mills, the recovery was permanent and complete, several years having elapsed since the operation.

possibly much of the good effected by trephining in traumatic cases might be brought about with equal certainty and more safety merely by raising the portion of the scalp containing the cicatrix. This I have done in some very recent cases, with the usual result of a temporary disappearance of the convulsions.

The accidental cures of epilepsy, 13 instances of which are included in the table, and the cases of relief from fixed pain afforded by simple trephining, are almost equally striking in the absence of any comprehensible relation between the traumatism and the disappearance of symptoms.

Passing from the cerebral to the spinal region, I will cite only one illustrative case.

A male patient, æt. 55, was attacked December 25, 1887, with severe pains in his arms and shoulders; three or four days later there was weakness of the thighs, spreading rapidly down the legs to the feet, and upward to the nipple line. In eight days there was absolute paralysis of the parts involved, including both sphincters, while at the same time the paralyzed parts became the seat of profound anæsthesia. Girdle pains developed, bed sores made their appearance; percussion of the spine over the third and fourth vertebræ became painful; the reflexes were exaggerated, and slight blows on the head in the direction of the spinal axis gave rise to frightful exacerbations of the girdle pain. These symptoms developed and increased in severity for ten months; all internal therapeutics were exhausted, and it was finally decided to trephine the spine, although one distinguished neurologist was positive we were dealing with a case of Landry's paralysis and that operation was unjustifiable. Dr. Dercum, in whose practice the case occurred, agreed with me that an exploratory operation was indicated, and I, accordingly, on October 17, 1888, removed the spines and laminæ of the first five dorsal vertebræ, opened the slightly thickened dura, separated some firm adhesions to the subjacent pia mater, explored the cord with my finger, and then having quite failed to discover any serious pathological changes, closed the wounds in the dura and soft parts. The girdle pain had entirely disappeared by the following day, sensation began to return in the feet the day after,

voluntary motion in the toes on the eighth day, and so one symptom after another disappeared, until the patient completely recovered, and is now earning his living by manual labor.[13]

Mundé[14] has reported a case in which after removal of the ovaries and Fallopian tubes, symptoms of chronic myelitis of the lumbar co⟩d entirely disappeared, although previously the patient had had an apparent hemiplegia and had for seven years been unable to move even the toes of the left foot. In two months after the operation she was able to walk perfectly and her recovery seemed complete and permanent.

Dr. W. R. Gillette[15] has recorded the case of a German girl who had been in many hospitals for severe dysmenorrhœa, pelvic pains, and epileptic seizures. She professed to live without eating, but it was found that she took bread in some surreptitious manner. The nurses watched her very closely and concluded that she was a hystero-epileptic. There was prolapse of the ovaries. The patient was very anxious to have an operation done, and her mother stated that doubtless she had been a real sufferer for several years. Dr. Gillette thought it a good case in which to try the influence of mind over matter, and made all the necessary preparations for oophorectomy, placed the patient upon the operating table, made an incision into the subcutaneous fat of the abdominal walls, and closed the wound. The patient improved wonderfully after the pretended oophorectomy.

I shall reserve my comments on these cases until I have completed my records, and shall pass on to the next group.

CLASS II.—ABDOMINAL AND PELVIC DISORDERS.

We may begin one list of these cases with a resumé of Mr. Tait's extraordinary experience. He says[16] that he has more than once drawn attention to the astonishing disappearance of tumors, often of large size, after a mere exploratory in-

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[13]ANNALS OF SURGERY, June, July, 1889, July, 1890.

[14]Amer. Jour. Obstetrics, Vol. 17, 1884, p. 1162.

[15]Amer. Jour. Obstetrics, Vol. 17, 1884, pp. 1164-5.

[16]Edinburgh Medical Journal, November, 1889.

cision. They have been chiefly cases of diseases of the liver, spleen and head of the pancreas, but he has seen others where the exact site of origin of the growth could not be accurately ascertained, disappear equally.

He gives the following illustrative cases:

A woman, æt. 30, had a tumor, supposed to be ovarian. On section it was evident that a mistake had been made. It dipped into the pelvis as a glutinous mass but had no connection there. Traced upward it was found continuous with the substance of the liver, to which it was attached by a pedicle 6 or 7 inches in width. An aspirating needle brought only a drop or two of bloody fluid. The wound was closed. She steadily improved, the tumor subsided and five years later was the size of a man's fist.

In another case of violent hepatic pain, jaundice, etc., the liver was found covered with small seed-like bodies which were thought to be miliary abscesses. Nothing was done. She immediately improved; and entirely recovered.

In another with hepatic symptoms. large, hard nodules of the liver were found and appeared to be undoubtedly carcinomatous. No attempt at removal was made. Recovery was prompt and complete.

In another a large indurated immovable mass in the position of the head of the pancreas was thought to be unquestionably cancer. The history and general appearance of the patient corroborated this diagnosis. Nothing whatever was done, but in a few days the patient began to improve and in seven weeks not a trace of the tumor was to be felt. She has remained in robust health.

Four times Tait has opened the abdomen for the purpose of removing enlarged spleens and in every instance has been deterred by the apparent hopelessness of the case. In three of the four patients the tumor disappeared and the patients regained perfect health.

He has seen a myoma disappear after an abdominal section intended for its removal, yet where nothing was done except handling the tumor with the result of deciding that it was irremovable.

This experience has been recently confirmed at a meeting of the Imperial Royal Society of Physicians, of Vienna, where Prof. von Mosetig showed a case of myo-fibroma of the uterus, from which the patient had suffered since February, 1888. She had severe pains in the sacral and pelvic regions, as well as constipation, difficulty in micturition, and metrorrhagia. Examination revealed the presence of a solid and elastic tumor, which was quite fixed and filled the poste-

rior cul-de-sac. At the request of the patient, who was anxious to
have something done, exploratory laparotomy was performed on
October 7. On opening the abdomen, a tumor, as large as
a man's head, and quite immovable, was found; it filled
the large and the small pelvis, and was close to the sacrum.
When the tumor was exposed it presented a peculiar appearance; it
became congested, assumed a dark-red color, and spontaneous rupture
of blood-vessels took place in some spots. As operation was not in
dicated under such conditions, the abdomen was closed. The ab-
dominal wound healed without any trouble, and the patient said that
the pain and discomfort were less than before. When she was ex-
amined a second time, fourteen days later, they were not a little aston-
ished to find that the tumor had shrunk to half its former size, being
scarcely as large as a child's head, and the tumor had become mova-
ble. It continued to diminish in size, so that when the patient was
presented to the Society it was scarcely as large as a man's fist. Prof.
von Mosetig did not know of any similar case in medical literature.
He explained the occurrence by the supposition that the disappear-
ance of the myo-fibroma was due to the intense hyperæmia which had
been observed during the operation, just in the same way as soft sar-
comata may disappear under the influence of severe erysipelas, etc.

Tait has had several cases in his own practice where such disappear-
ance has been completely effected; but adds that unfortunately he
knows of a very much larger number where no such result has been
obtained; and that, therefore, whilst no dependence can be placed on
mere exploratory incision as a method of treatment, this strange fact,
coupled with many of a similar kind, constitutes an argument for the
free application of the principle of exploration.

Another case may be given in his own words:[17] The lady was
a Jewess, æt. 34, in whom a large myoma had been diagnosed
by the late Dr. Schroeder, of Berlin, and others, and in that
opinion I certainly agreed when she was brought to me in May, 1888.
From the tumor she was suffering very little, and was hardly conscious
of its existence, but she suffered much from a gall-bladder full of con-
cretions, and this was the immediate cause of her being sent to me by
Prof. Gluge. I performed cholecystotomy a few days after I saw her
first, at which time the myoma reached quite half way up to the um-
bilicus. I did not, of course, go anywhere near the tumor at the time
of the operation—did not touch it. I saw her again a fortnight ago
(November, 1889), and found to my delight that the myoma had

[17] Diseases of Women and Abdominal Surgery, Vol. 1, 1889, pp. 192-194.

receded into the pelvis, and was certainly not one-third of the size it had been six months before. There could be no other known cause of its reduction than the abdominal section, as no kind of treatment had been directed towards it—as a matter of fact, the patient had forgotten all about it.

The history of cases of tubercular peritonitis treated by abdominal incision is now so well known that it need not be gone over in detail.

König[18] has recently summarized 131 cases of peritoneal tubercle treated in this manner. Of these 89 were cured, 23 were greatly improved. Of the 89 cures 30 exhibited no signs of intra-peritoneal tuberculosis several years afterward.

Spencer Wells has reported one case of twenty-five years' standing, Schücking one of fifteen years, and Stelling one of thirteen years.

As to the method by which these results were obtained, examination of the cases shows that there was only one condition common to all; that is, the belly was freely opened, and a certain amount of intra-peritoneal manipulation was practised. In some cases the incision was merely diagnostic; in others the liquid was evacuated as freely as possible; in still others, more radical surgical measures were adopted, curette, scissors and knife being used. All of these measures were followed by cure. Even the employment of anti-bacterial agents, often considered the sole factor in the favorable result, seems to be absolutely without influence. In eighty cases the abdominal cavity was washed out with antiseptic solutions, or sprinkled or rubbed with iodoform. In fifty cases no anti-bacterial agents were employed. Apparently a greater percentage of cures followed where no disinfectants were used.

A question of major importance is as to whether only certain forms of peritoneal tuberculosis can be cured by section. As is well known, the effusion may be serous, sero-fibrinous or purulent; may be circumscribed or diffuse. The tubercles may vary in size, being miliary in one case, in another as large as a hazelnut. The peritoneum may be smooth, roughened,

[18]Centralblatt f. Chirurgie, No. 35, 1890.

thickened or covered with pseudo-membrane. In so far as clinical studies go, it would seem that all these different forms of tubercular peritonitis have undergone resolution after abdominal section, and consequently that they are all curable.[19]

Professor Annandale[20] has reported a case in which long-standing gastric symptoms were completely relieved by abdominal section and the raising up of depressed ensiform and costal cartilages. A young man, eight years previously, had received a severe blow upon the left side over the lower cartilages and sternum; dragging pain in the region of the stomach with vomiting had resulted, and continued, in spite of treatment, with more or less aggravation. Being unable to work, and the diagnosis from external examination not being satisfactory, an abdominal incision was made as if for gastrostomy, and the parts explored; no condition except a morbid depression of the lower costal and ensiform cartilages being found, these cartilages were divided and raised up. The result was complete relief to his old symptoms, and the patient, when seen two weeks ago (nearly six months after the operation), remained quite well.

In the discussion which ensued, Mr. Bryant said that he felt it difficult to criticise such cases, which belonged to a class unfortunately becoming more common, where operations of exploration or discovery were undertaken with failure to find out more than was known before, though in many cases results were obtained in ways we could not explain. Such cases were interesting, but dangerous, tempting the rasher ones to explore more freely than should be done.

One could hardly think that the depression of the cartilages gave rise to all the symptoms described, and he thought surgeons should be grateful to Professor Annandale for placing such a case on record.

Mr. Treves, in the same connection, referred to the remarkable improvement which sometimes followed after exploratory laparotomy in apparently hopeless cases. He had seen a case of tubercular peritonitis get well after simple exploration. He had twice opened an abdomen, discovered pyloric cancer, and closed again without interfering with it; one man was substantially better in every way for ten days; the second underwent so remarkable an improvement that there was a doubt of the diagnosis; he continued better for six weeks, and then the old symptoms returned and he died, the necropsy revealing extensive carcinoma.

[19]Univ. Med. Mag., November, 1890.

[20]London Lancet, 1889, vol. i, p. 330.

Mr. B. Jessett related the case of a man, æt. 45, who suffered with severe and continuous vomiting, and pyloric cancer was thought to be present. He had a large reducible hernia of 25 years' standing, for which he had never worn a truss; after radical cure of this he made a perfect recovery.

Professor Annandale quite admitted his inability to explain the reason of the result obtained, and he related a case in which distressing renal symptoms were present, which were cured by a negative exploratory excision.

The following cases have been briefly furnished me in response to letters of inquiry, many of them not having been published previously:

I can recall but two cases, both of which were operated upon some years since by our friend, Dr. H. F. Campbell, I being with him both times.

The first case was one of intestinal obstruction with great abdominal tympany and with tenderness generally diffused over the whole abdomen. Laparotomy was performed by an incision of three to four inches. Patient slowly but steadily recovered.

The second case was one of perityphlitis, due to over-indulgence in blackberries. There was complete intestinal obstruction, fever and some distension. Suffering intense. Tympanitis and tenderness in right iliac fossa. Exploratory laparotomy was done. An aspirating needle inserted at several points failed to reveal the existence of pus. Peritoneum not incised. Wound left to granulate. Patient made an uneventful recovery. Jno. S. Coleman.

Augusta, Ga., March 21, 1891.

I have had two cases of fibroid tumors of the womb as large as the adult head, dwindle down almost to an inappreciable size after an exploratory incision. In each instance the object of the operation was the removal of the ovaries. But they lay behind a universally adherent tumor and could not be touched. William Goodell.

Philadelphia, March 27, 1891.

I opened the abdomen in a young primipara in her sixth month for severe constant localized pelvic pain, thought to be due either to a pyosalpinx or an appendicitis. Nothing whatever abnormal was found. The wound was closed. Pain disappeared entirely.

Philadelphia. Barton C. Hirst.

A young woman, æt. 24, suffering from obstruction of the bowel, had fæcal vomiting for three days before operation. She had been suffering slight pains in the abdomen for a long time but nothing to prevent her from going to her work.

I was asked to operate for the relief of the obstruction. There was a tumor of considerable size extending from the left side of the pelvis, where it was most prominent, then spreading over the entire abdomen. An incision two inches long was made down to the tumor or mass and a plucky effort made to find out what it was; failing in this, the incision was extended to eight inches and the abdominal wall released with great difficulty from the tumor, from crest of ilium to crest of ilium and from pubes to diaphragm, the adhesions being almost as strong as the skin itself. With fingers and knife I continued the dissection into the mass without seeing a single knuckle of intestine or any landmark to indicate their presence. After one hour of continuous effort at investigation with considerable loss of blood, I concluded I had done all within the bounds of safety; that it would be better to let the patient recover from the ether and the disease destroy her than to continue the operation under the hopeless outlook with the prospect of having her die on the table. The wound was carefully cleansed and sutured and the opinion given she could not possibly live longer than a few days. The patient reacted well from the ether, was nourished by the bowel, on the second day had natural movement from the bowels and, now, eight weeks after the operation, is rosy, bright and well, with a small tumor in the left groin.   MORDECAI PRICE.

Philadelphia, March, 1891.

I have opened the abdomen in two cases when I did not know what the matter was and don't now, but the patients both got completely well. One appeared to be malignant and for that reason upon the advice of all present I abandoned the operation and told her husband I thought she would die. She got well and has since had a baby and is now in good health. The other had been in bed six months with what all diagnosed as chronic peritonitis. I did find a few adhesions, which I broke up. The uterus and ovaries were all right. She got well.   JOS. T. JOHNSON.

Washington, D, C., March 24, 1891.

A young woman, multipara, consulted me in my clinic, complaining of the most intense pain in the left ovarian region. She really was in

agony. This continued for quite a long time, several weeks if I remember correctly, before I determined to operate. She lost flesh and strength, was bedridden, had temperatures from 101 to 103, could not be touched in the ovarian or hypogastric region without causing a scream.

On opening the abdomen, which I had determined upon, because at the time of my first examination and also subsequently, an indefinite fulness was felt resembling a distended Fallopian tube, absolutely nothing was found to account for a single symptom. She was merely washed out and sewed up again. Recovery in every respect was prompt and perfect *   H. J Boldt.

New York City, March 9, 1891.

I have known of instances where livers were tapped for abscess of the liver without pus being found, when both the doctors and attendants and the patients have thought it had been beneficial, and in the *London Lancet*, some years ago, I saw cases mentioned of similar character.   J. M. DaCosta.

Philadelphia, Pa., March 23, 1891.

A patient of mine had every appearance of an ovarian tumor. Dr. Joseph Price and Dr. D. Hayes Agnew were called in and after careful examination and consultation we all thought the history of the case and the other symptoms justified ovariotomy.

Dr. Price performed the operation. When the abdominal section was made, to our surprise, it was a lipoma which was cut through and we found nothing else. Under the tonic influence of the knife by cutting through it in the course of time it entirely disappeared leaving

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*John G. LeConte, M.D , Savanah, Ga., reports the case of a colored woman, æt. 29, stunned by lightning. Menstruation perfectly regular prior to the shock; afterwards very irregular, there being sometimes two periods in one month, and sometimes only one in two months. Quantity much diminished.

Also the case of a colored woman, æt. at least 70, also shocked. The catamenial discharge which had, in accordance with the ordinary arrangements of nature, ceased for more than 20 years, was completely re-established. At least a discharge from the genital organs, having all the obvious and sensible physical character of the catamenia and observing with rigorous exactitude its peculiar law of periodicity was established and continued to recur until the date of the report—over one year. She had not missed a single period. Her mammæ underwent a preternatural enlargement. The electric shock likewise completely relieved her of a troublesome strangury which had harassed her for four or five years.[21]

[21] N. Y. Jour. Med., 1884, iii, p. 296.

the patient quite well and relieved of the burden of what we supposed
was an ovarian tumor.   The patient was benefited by the operation,
although no part of the fatty tumor was removed.   D. F. WOODS.
   Philadelphia, Pa., March 24, 1891.

   A lady somewhat well along in years, under the care of Dr.
W. C. Bailey, of Albion, New York, during the past few years
of her life presented a most remarkable case of fibrinous or
membranous enteritis.   These features of her case will be reported
in due time by Dr. Bailey.   With him I saw her several times,
and when I first saw her she was irrational a large part of the time.
She presented crises of pain in the hepatic region with a
marked area of tenderness, and apparently a little swelling,
and her general condition and history as well as the local
conditions made it very probable that we had to do, for one
thing, with a case of abscess of the liver.   I introduced a long explor-
ing needle, and while not finding fluid pus, I nevertheless withdrew
with the needle cells, which, under the microscope, were so strongly
suspicious that I advised operation; this was done a little later, a free
incision being made just below the costal border; after reaching and
exposing the liver I punctured at least six times in different directions,
and to considerable depth, with a still larger exploring needle, but failed
to find any pus.   The gall-bladder contained a few calculi, but inas-
much as, so far as we could see, she had never suffered from their
presence, I left them there undisturbed.   The exploratory incision
healed by first intention, and, to our surprise, from the day of the op-
eration all her pain and local tenderness subsided and never recurred.
She and her family were always strongly of the belief that her relief
from her distressing condition was due entirely to the operation which
had been performed, in which view naturally we could not but coincide.
   This is the most marked demonstration of the possibility of such
cases as those to which you refer that has ever come under my notice.
Of course like yourself I have trephined for intense headache when I
found nothing which would be generally considered pathological, and
yet with relief of pain.   So also in operations on various nerves, we
seldom if ever find the actual cause of pain, although the latter symp-
tom we relieve.
   I have had another case of obscure liver disease in which jaundice
and pain vanished almost from the hour in which a number of explora-
tory punctures were made from the outside, in the endeavor to detect
pus if present.   This lady even places such an exaggerated estimate

on the slight service as to state to her friends generally that I had saved her life by the little operation.

Aside from this I have repeatedly seen marked benefit from puncture with the exploring needle, especially in the ileo-cæcal region. I have in mind at the present moment three cases where I was called in consultation to ascertain whether we had to deal with a perityphlitic abscess. The signs being indefinite in each of these cases, I made several punctures with the hollow needle, and as above, in every instance there was diminution of pain from the time of the puncture, while speedy resolution of the inflammatory exudate seemed to have been provoked by the slight mechanical result. From these and similar experiences following the use of the needle, I have learned to regard it and speak of it almost as did Pancoast of his antiphlogistic touch of the knife. ROSWELL PARK.

Buffalo, N. Y., March 15, 1891.

Some time ago I operated upon a patient for salpingitis. Subsequently the woman returned complaining of a renewal of her old pelvic pains. On looking up her record I found it stated that only one tube had been removed. I concluded therefore to repeat the operation on the other side. After making incision I was greatly surprised to find both tubes had been removed in the first operation, and that the history was incorrect. I accordingly closed up the abdominal incision and was not a little astonished to find that the patient subsequently declared herself to feel perfectly well, and has, I believe, had no return since of her distressing symptoms. WILLIAM T. LUSK.

New York City, March 18, 1891.

I opened the bladder by the perineum; found nothing; wound stayed open for several months; symptoms relieved.

I opened the abdomen, and found an irremovable tumor; symptoms relieved; tumor shrank. D. W. CHEEVER.

Boston, Mass., March 8, 1891.

Two well marked instances of restoration to health following simple laparotomy have been met with in my experience.

Two years ago, I was called to a distant town to remove a tumor from a lady's abdomen, the character of which was uncertain. After seeing the case and making a thorough examination which did not disclose its nature satisfactorily, I advised against an operation. So much pressure was brought against this decision by the family physician and

the friends of the patient, that I finally concluded to make an explora-
tion.   It proved to be a very soft mass of large size connected with
the uterus, and probably a soft myoma.   I had with me neither the
assistance nor the means to make a hysterectomy, so I refused to go
any further and closed the wound; the pain from which she suffered
was entirely relieved and within a year the tumor entirely disappeared.
The patient was about 35 years old.

The second case happened about eight months ago and the patient
was suffering from a tumor in the abdomen of large size in or about
the liver; the margins of the tumor reached below the umbilicus.   The
man was in great pain and was emaciating rapidly.   An exploratory
operation was determined upon with the hope that the difficulty would
turn out to be an abscess of the liver.   An examination of the mass
after it was exposed, disclosed it to be the liver itself immensely en-
larged.   It was perforated in several directions with the aspirator and
no pus found.   The man recovered from the operation without
mishap; the enlargement decreased so rapidly that in six weeks' time
the liver was of normal size and the patient resumed his usual occupa-
tion.

I have records of four cases of entire recovery after laparotomy had
disclosed the presence of tuberculosis of the peritoneum without the
removal of any organ or tumor.   CHAS. T. PARKES.

Chicago, Ill., March 6, 1891.

I cannot remember more than one case that it seems to me would
come under the category of those that you wish.   That was a case
which I saw last summer of a young girl æt. 14, whose menstruation
was stopped somewhat abruptly by exposure to cold, and who had,
following that, a severe attack of pain in the lower part of the abdomen.
A cake appeared in the central line of the abdomen over the pelvis
and her fever ran very high, 104° and over.

When I saw her after three or four weeks she was running this high
temperature and there seemed every reason to believe that there was
pus in the middle of this cake.   I made a laparotomy for the purpose
of evacuating the abscess if I could find any, but found all the pelvic
organs fastened together in one mass by inflammatory exudation.
Tried to find pus in some parts of it by puncture with the aspirating
needle without success, and finally closed the wound without having
apparently accomplished anything.

From the time of the operation she got rapidly better, and the mass
disappeared, until, finally, this winter she has been perfectly well, rid-

ing over rough roads in North Carolina, and with no return of pelvic symptoms.

I have known of one or two cases somewhat similar to this occurring in the experience of others where a similar exudation disappeared after operation, or puncture with an aspirating needle. I hope that this case will come into the line that you are investigating.

Boston, Mass., March 13, 1891. A. T. CABOT.

I operated some years ago upon a man for supposed stone in the bladder. He had all the symptoms of calculus and I thought I felt it before cutting. I found no stone but the man got well and never had a return of his old symptoms.

Among my laparotomies I have in two cases opened the abdomen, found the ovaries healthy, closed the abdominal wound without removing these organs. Both of these cases recovered from the operation and got rid of the various neurotic symptoms which before the operation had almost completely disabled them. The moral effect in these three cases cured the patients. HUNTER McGUIRE.

Richmond, Va., March 6, 1891.

CASE I.—Married gentleman, æt. 44, for about one year suffered from attacks of severe abdominal pain which by two or three physicians were regarded as hepatic colic. These paroxysms became more frequent and prolonged and seriously impaired health. One was especially severe and being associated with an icterus and of long duration was regarded by his physician and a consultant as an instance of impacted chololith.

The abdominal wall was incised obliquely in such a manner as to have the base of the gall bladder correspond with the middle of the four inch incision. This viscus was found to be normal, contained no calculi and possessed a patulous duct. The incision was closed with silver wire, union was somewhat tardy, due to granulation, but never since, now nearly seven years, has there been a return of the trouble.

CASE II.—A German, æt. 46, had chronic diarrhœa with abdominal tenderness and with a recognizable resistance and sense of hardness over hepatic flexure of colon and a little below and across. Malignant disease of this flexure was diagnosticated and palliative means of relief instituted. After a time, some 8 or 10 weeks, severe paroxysmal pains having developed and been suffered until they seriously impaired health, an exploratory incision was consented to with the full knowledge of patient that perhaps nothing could be radically done. The

incision was made in the linea alba and the upper third of ascending colon, its hepatic flexure and half of transverse portion found to be universally carcinomatous. The omentum major was largely involved. Incision closed with silver wire; stitches removed within eight days, union perfect. The intense paroxysmal pains did not recur and from their total relief the patient actually temporarily gained in flesh and strength. In the course of a few months the malignant trouble manifested itself in its usual manner and exhaustion terminated the scene·

CASE III.—A German lady, æt. 47, from whom 4 years before I removed an almost universally adherent ovarian cyst, again consulted me for the relief of severe abdominal pain. This was paroxysmal and at times so intense as to cause mild shock. The line of incision of original operation felt nodular and hard, and several sharply defined ovoid masses, movable under abdominal wall, were easily discernable. As the original cyst, which weighed $37\frac{1}{2}$ pounds, had on its inner wall about half a dozen small wart-like protuberances, not larger than a pea, I diagnosticated carcinoma of omentum, and advised another laparotomy. The cicatrix of the first operation with all the involved abdominal wall was excised and the omentum removed close up to the colon. The retro-peritoneal lymphatic glands were, for obvious reasons, untouched, although they were large and bulged well into the abdominal cavity. Incision healed promptly, and, notwithstanding the large lymphatic masses left remaining, the severe paroxysmal pains never again occurred. She ultimately died of total occlusion of the bowel and the exhaustion of general malignant disease.

CASE IV.—A poor woman applied to an eleemosynary institution for relief of an exceedingly painful abdominal tumor (solid). An incision in the linea alba disclosed retro-peritoneal sarcoma. Incision was closed after doing nothing but dusting iodoform over peritoneum, and while everything was left untouched the pains never again occasioned suffering. The malignant disease ran its course and terminated life in a few months, but that conspicuous element, severe neuralgic abdominal pains did not recur.   HENRY BEATES, JR.

Philadelphia, March 20, 1891.

In one case I opened the abdomen for presumed multilocular ovarian cyst, but the mesentery was found to be sarcomatous to such a degree as to forbid further surgical interference. Although the woman was supposed to be sinking rapidly prior to the section, she recovered her strength and health to a large degree, and for some six months thereafter she was fairly comfortable. I then lost sight of her, and learned that she subsequently died from other causes.

The second case was one in which I did a laparotomy for supposed pyosalpynx. The tubes were found to be normal and were not removed; the ovaries, however, were undergoing cystic degeneration perceptibly, but were, at my suggestion, left alone, with the intention of treating them by electricity. The woman made a good recovery, and is now in splendid health (five years after the operation) due, as I hold, to the electric treatment, but my friend who furnished the case believes the section to have been the factor working the cure.

Philadelphia, Pa., March 20, 1891. WM. R BLACKWOOD.

Man, æt. 55. Typical history of cancer of the stomach. Movable nodule, about the size of an egg, easily felt just below the rib margin in the nipple line of the left side. Patient suffering from intense pain, preventing all rest except that procured by administration of morphia. Vomiting followed immediately upon the ingestion of food.

Exploratory abdominal incision. The peritoneal cavity was filled with serum. The stomach, after very gentle palpation, was found so extensively involved in the cancerous disease that the idea of operation could not be entertained. The parietal wound was closed, without draining away the serum, and healed in six days, no reaction having followed the operation. The patient was not under ether more than of twenty minutes. On regaining consciousness he declared that his pain had entirely left him, nor did it again return The attacks of vomiting became much less frequent and the patient's subjective symptoms were practically cured. He died two weeks after sec tion from progressive exhaustion. EDWARD MARTIN.

I can recall a number of cases where lesions were found which could not be removed, wherein the symptoms disappeared for a considerable length of time under the mistaken impression that the lesions had been removed.

I have known menses to disappear and severe dysmenorrhœa with it under the mistaken impression that the ovaries had been removed.

It is my uniform observation in laparotomy, when I have made an exploratory incision for diagnosis and passed a hand, or simply a finger, into the peritoneal cavity, if the patient be kept for a time in ignorance of what has been done, she experiences a notable relief from her sufferings. This I have observed very many times.

In one notable case I had promised the patient and her husband not to subject her to any extra hazards in the removal of her ovaries, and finding these organs buried in very extensive and firm adhesions,

I closed the abdomen with a simple exploration. It was a case of hæmorrhagic and extremely painful menstruation. The menses promptly stopped. She passed eight months without her periods very comfortably in ignorance of what had been done in her case. Her family physician, feeling that she was quite secure, explained to her the situation. It was scarcely a week until the menses returned with the same violent pain as before and she returned to me, determined to take any risk for relief. I tore up the adhesions and removed the ovaries with a prompt and complete cure of her malady.

Rome, Ga, April 7, 1891. ROBERT BATTEY.

I can recall but one personal case where nothing was found, yet relief was afforded, and that was a case of pleurisy (supposed) with agonizing pain. A few drops of serum were withdrawn by an ordinary hypodermic syringe, but when I introduced the trocar nothing further was obtained, do all that I could, yet the pain was relieved, did not return, and the patient commenced to mend.

I am sure that other cases have occurred in my practice where operations discovered nothing, yet benefit accrued—still I cannot recall them. Of course, I presume that your question does not refer to operations for epilepsy, headache, etc., where nothing was found beyond what was *assumed* to be sclerosed and thickened bone ; if you do, I have had two such cases within six months recently, one where the headache, dizziness and inability to do brain work had lasted—increasing much of late—for 26 years, in which complete cure seems to have resulted; the other where *grand mal* has been apparently put a stop to and the *petit mal* almost abolished.

Ann Arbor, Michigan, April 3, 1891. C. B. NANCREDE.

CASE I.—Operation April 7, 1885. Miss S., æt. 37. Pelvis filled with a fibroid tumor extending upward to within an inch of the umbilicus. Had frequent attacks of peritonitis during last three years. Tumor almost immovable, left ovary can be felt on the front of the tumor; right ovary resting on vault of the vagina beneath the tumor.

Incision four inches in length. Intestines highly congested, considerable ascitic fluid present, tumor firmly fixed by strong adhesions. Washed out the belly thoroughly with hot water and closed the wound. In six weeks the patient was better than she had been for years, the growth of the tumor was arrested, and at last accounts she was still improving in health.

CASE II.—Operated December 16, 1887. Mrs. H., æt. 40. Mar-

ried at 18 years. Miscarried six months later, which occurrence was followed by severe pelvic inflammation; continued in wretched health and sterile until 34 years of age, at which time, she says, a tumor was discovered in her pelvis. Habitual dysmenorrhœa and chronic invalidism have brought her to me. An examination revealed the pelvis full of solid exudates, the uterus firmly fixed

Incision in the linea alba three inches in length. Intestines adherent to the mass in the pelvis, also the tail of the omentum. It was barely possible to pass one finger down into the pelvis behind and to the right of the fundus. Some of the adhesions were broken up, the belly was washed out with hot water, and the wound closed. Healing was prompt, and a year later she was reported very much improved in health.

CASE III.—Operated June 12, 1888. Mrs. U., æt. 41. First confinement followed by two false conceptions. Later conceived and miscarried at four months. For years afterward was the subject of uterine treatment. During several years past has, at intervals, discharged pus from the rectum. Recently an accumulation of pus has discharged through the rectum. Efforts to reach the abscess sac were futile.

A three-inch incision in the median line revealed pelvis filled with exudates. Uterus, tubes and ovaries *en masse* fixed. Cavity irrigated with hot water and wound closed. Healing uninterrupted. I met this woman with her husband the following July so much improved that I did not know her. Later I learned that she had gained 25 pounds and was in excellent health. R. STANSBURY SUTTON.

Pittsburg, Pa., April 10, 1891.

Dr. John H. Musser[22] has reported a case of supposed biliary calculi of five years' duration, followed, at the end of that time, by intense jaundice and the development of a tumor one inch below the margin of the ribs in the right hypochondrium, dull on percussion, hard, tender, not fluctuating and of about the size of an egg, the diagnosis of biliary colic, impaction of calculi and enlarged gall-bladder being confirmed by Dr. Pepper in consultation.

Cholecystotomy was attempted The gall-bladder could not be found or recognized although a hard mass as large as a fist was discovered attached to the liver, colon and small intestine. Nothing was done except to close the wound.

The operation was followed by considerable hæmorrhage and finally

[22]American Journal of Medical Sciences, vol. 88, p. 333.

by suppuration. The patient steadily improved. There was never any more paroxysmal pain, the jaundice disappeared and three years later he was reported as in perfect health.

Dr. William Mastin[23] has reported a case in which an exploratory laparotomy revealed a large, solid abdominal tumor (splenic), but with such vascularity and such dense and extensive adhesions as to prevent removal. The operation was followed by marked improvement in systemic conditions and considerable diminution in the size of the tumor.

G. Volney Dorsey, M.D.,[24] has recorded the following case: Male, æt. 40. History, ague. Ague cake. Intense pain in the region of the spleen. Patient clamorous for an operation. Operation September 2, 1855. Incision six inches long. Abdominal muscles, fascia, peritoneum, perfectly normal. Spleen adherent for a space of several nches; hard, somewhat enlarged. Intestine protruded largely during operation; adhesion of spleen broken up. Nothing else done. Perfect recovery. No more pain.

This case is paraded in most text-books as one of *splenectomy*!

Recently M. Routier[25] has related an interesting case of laparotomy for jaundice of a severe type. A nurse in the hospital was seized with severe hepatic colic lasting 24 hours. In spite of energetic treatment jaundice set in, the fæcal excretions were discolored and the urine almost black The liver was felt below the false ribs, and the gall-bladder was painful. For a whole month the condition of the patient remained unchanged, and at the end of that time vomiting set in, and the patient became much emaciated. Believing that a biliary calculus was obstructing the bile duct, the surgeon determined to explore the region, and for that purpose laid open the parts by an incision on a level with the inferior edge of the liver. Passing his fingers through the wound he felt the gall bladder, which did not seem in any way distended, and consequently was not obstructed. He passed his fingers then over the inferior edge of the hepatic organ but found nothing abnormal. Before withdrawing his hand he felt the head of the pancreas, but no tumor was discovered there. Finally, he closed the wound, and, strange to say, the vomiting, which had been previously uncontrollable, ceased, and in two days afterwards the jaundice paled,

[23]Medical News, March 17, 1888.

[24]Med. Counsellor, 1855.

[25]Medical and Surgical Reporter, April 11, 1891.

and in a week the urine assumed its normal color, and the patient speedily recovered. Routier could only explain the happy result by the fact that the massage displaced some mucous collections which had obstructed the flow of the bile.

Dr. Geo. C. Kingsbury[26] reports a case of Dupuytren's contraction of the palmar fascia occurring in a man, æt. 45, who had been subject to acute rheumatism, but was otherwise healthy. His father had for years suffered from phalangeal contraction of the ring and little fingers of both hands. The patient was a barber by trade. His right hand had been affected for 12 years and his left for eight years. Two treatments with hypnotism caused the disappearance of the pain, which had previously been severe, and resulted in the complete return of motion to the hands and fingers.

The case was reported two months later and the cure seemed to be permanent.

Dr. W. M. Chamberlain[27] reported a case in which the abdominal wall was divided nearly down to the peritoneum, and the wound was then sewed up. Six weeks afterward the patient was entirely relieved of dysmenorrhœa and other symptoms.

I have recently done a pretended laparotomy in three cases with pelvic pain, ovarian neuralgia and distinct symptoms undoubtedly of sufficient severity to warrant a full exploratory operation and probably an oophorectomy. In one case a mass the size of a hen's egg was to be felt to the left of the fundus; in another there was thickening and increased resistance of the broad ligament close to the cornua; in the third nothing definite could be made out by vaginal touch, but the subjective symptoms of pelvic inflammation were very marked, The previous histories were taken and the conditions confirmed by the chief of the out patient gynæcological department of the hospital. My operations consisted of lineal incision down to but not through the aponeurosis; the wounds were immediately stitched with interrupted sutures; no ligatures were applied. A full antiseptic dressing as if after laparotomy was employed. Union by first intention took place. It is too soon to report results, but (the end of a month) two of the three patients "feel like different women," to use their own words. This is not the result of the rest, as they had previously been in bed for some time.

[26] British Medical Journal, Jan. 10, 1891.

[27] American Journal of Obstetrics, 1884, vol. xvii, p. 1165.

A subdivision of class 2 includes the operations upon the genito-urinary tract, the most striking of which, in this connection, are those of supposed kidney-stone, in which, symptoms of calculous pyelitis being present, the kidney has been cut down upon, the capsule incised or punctured, no stone discovered and the wound closed, all pain afterward disappearing.

Tiffany's[28] collection of cases affords several examples of this sort, a few of which may be summarized. His own case was one in which increasingly frequent paroxysms of nephralgia demanded operation. No stone was found. A scar of the kidney was noticed. The capsule was freely divided. Relief from pain was marked and immediate.

LeDeutu[29] operated in a case of continuous pain following several attacks of nephritic colic. Nothing found. Incision into kidney. Complete cure.

Jordan Lloyd, Clement Lucas, Barker and others are quoted in the same paper, their cases being of less value, however.

In a case reported by Dr. James K. Chadwick[30], the kidney was cut down upon in consequence of persistent symptoms of renal irritation.

It was normal in all respects. Its pelvis could be easily reached by the fingers, but no trace of a calculus could be found there or elsewhere. A long needle was then passed through the cortex into the parenchyma in various directions in the expectation of detecting a stone, but in vain. All symptoms disappeared.

Dr. Geo. J. Engelmann,[31] in commenting on this case, said: In one instance, the case of a colleague, I have seen a precisely similar result, in which the operation was performed because all those who had seen the patient, after a careful examination, had determined that the suffering must be due to the presence of a stone. No stone was found, and yet after an apparently useless nephrotomy, although some tenderness remained, the intense colicky pains entirely vanished.

The two following memoranda were sent in reply to my inquiry:

[28]Trans. Amer. Surg. Ass'n, 1889.

[29]Bull. de Therap., 1881, p. 343.

[30]Trans. Am. Gyn. Society, vol. xv, 1889, p. 366-7.

[31]Trans. Am. Gyn. Society, vol. xiv, p. 384.

I have only one such case. It is, like Tiffany's, supposed renal calculus. None found. Patient relieved by the incision.

New York, March 5, 1891. R. F. WEIR

In 1889, a lad, about 18 years old, with well-marked paroxysms resembling renal colic, was on the medical side of the New York Hospital, and after several attacks was transferred to me. I exposed the kidney, found it entirely normal, and, by the way, noticed distinct, regular, peristaltic action of the pelvis and ureter. Primary union followed. He remained under observation of a nurse in the hospital for many months, and had no recurrence. LEWIS A. STIMSON.

New York, March 5, 1891.

[TO BE CONTINUED].

A CASE OF RUPTURED KIDNEY FROM A RAILROAD ACCIDENT, WITH REMARKS.[1]

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THE following case is of peculiar interest, as the injury is one very frequently produced by railroads, and very fatal in its consequences.

On January 27, 1891, I was called to Oil City, Pa , by a dispatch, stating that a man had been severely injured by a railroad accident, and that probably a laparotomy would have to be performed. On arriving, late in the evening, I saw the patient, Mr. A. Wood, æt. 22, and learned from his attending surgeons the following history:

Late in the evening on January 23, four days previously, he was caught obliquely between the bumpers while coupling cars. He stated then that he was not seriously hurt, and could continue work as brakeman on a freight train. He actually did ride 30 miles on the train, but then had to give up on account of faintness, pain and vomiting, and was brought back to Oil City, where Dr Coulter was called to see him on January 24, at 3:30 A M. He found no visible injury, no fracture of pelvic bones, no particular tenderness in abdomen, except in right iliac region, where he had considerable pain by pressure. No ecchymoses were present anywhere. At this time he was not considered seriously hurt. During the day (January 24) the patient could not urinate, and was in great distress on that account. He managed at last to empty his bladder. and the water contained a great amount of blood. After that his bladder was emptied with a catheter three or four times a day, and the urine continued to contain more or less blood.

On January 24 the temperature began to rise, being 102.5°, but afterward gradually receded to 100.5°. The pulse ranged from 100 to 108. On the same day tympanitis commenced, although not exces-

sive. Some flatus were passed on January 29. No hiccough. On examination the patient was seen to be a strong healthy young man. Temperature, 102°; pulse, 108, full and regular.

Considerable meteorismus was present, with tenderness in right iliac region. No particular tenderness in left side of the abdomen. The meteorismus prevented a careful examination of the abdomen. Over the right lumbar region a diffuse echymosis and some fullness and muscular rigidity were seen, and he was very tender upon deep pressure here. There was slight ecchymosis around anus and in perineum.

The urine was normal in quantity, but intimately mixed with blood, and of a dark, dirty color. It contained no coagula of blood. His bowels had not moved, he having been kept under the influence of opium since the injury.

The question of diagnosis was first discussed. It was evident that the man was seriously hurt, but I thought we could exclude any injury to organs in the abdominal cavity. A crush or rupture of the bowels would probably have terminated fatally before that time by diffuse peritonitis, of which there were no signs. True enough, he had considerable meteorismus, but not more than could be accounted for by a slight traumatic peritonitis and the continued opium-treatment. The normal quantity of urine, of course, excluded rupture of the bladder, not to mention the absence of diffuse peritonitis. A rupture of spleen or liver would probably have terminated fatally by internal hæmorrhage in a short time.

The ecchymosis over the right lumbar region, on the other hand, the deep-seated pain and swelling here, the muscular rigidity, the intimate mixture of the urine with blood, the fact that he vomited immediately after the accident, but else was able to travel 30 miles and then first became faint and had to give up work, and lastly the tenesmus of the bladder, pointed directly to the right kidney as the seat of lesion, and I thought I was justified in diagnosing a rupture of this organ.

The next question, whether he could be removed to Buffalo, as his family insisted upon, was settled with the diagnosis, and Dr. Coulter and I left the same night with the patient on a special train, and arrived in Buffalo at 6 o'clock on the morning of January 28, the patient having stood the journey well. I had him transferred to the Emergency Hospital, and gave the order to have him take j of epsom salt immediately, and ss every hour afterward till copious evacuations occurred, and to have him transferred to the Sisters' Hospital for operation at 11 o'clock. On his arrival there he had had several copious

evacuations, with the result that the meteorismus had disappeared. An indistinct deep swelling, with intense tenderness by pressure, could now be felt in the right iliac region. Under ether narcosis exploratory incision of the right kidney was made in the usual way by an incision four inches long and two and one half inches from the spine, extending from twelfth rib downward toward spina ilei posterior superior. Having reached the lumbar fascia, the usual yellowish white color was seen changed to an intense dark color from infiltration of blood. On passing through this fascia a large cavity was opened, containing about a pint of dark bloody fluid and coagula. The lower half of the kidney was found crushed to a pulp, and in feeling very much resembling that of an epithelioma of the uterus in the process of disintegration.

The question of nephrectomy was now in order, but bleeding from the crushed kidney was so copious by the slightest touch or manipulation, that all I could do was quickly to remove the blood coagula, disinfect the cavity with corrosive sublimate, and then pack it firmly with iodoform gauze, over which an antiseptic dressing was applied. One or two results were possible. Either the crushed parts might become eliminated by and by, and under favorable circumstances recovery might take place, or else, the bleeding having stopped and inflammatory thickening and adhesion having occurred, a nephrectomy might, later, be performed.

On February 3, urine was noticed to pass through the wound. The dressing was changed without bleeding, and a new one applied. On the same day the water commenced to clear up, although still containing considerable pus. He gradually improved, the large cavity contracted more and more, the urine became more and more normal, the crushed parts of the kidney came away by irrigation, and on March 16, he left the hospital with the wound healed, with the exception of a small fistula, through which scarcely anything was discharged. The fistula has since healed completely, and the patient is in excellent health.

I desire to add a few general remarks on the subject of crushed kidneys. In regard to the etiology of ruptured and crushed kidneys, blows, falls and crushes are mentioned as the most frequent causes, not considering the cases which are produced by gunshot wounds, etc. A quite frequent cause, probably the most frequent, are crushes between the bumpers of railroad cars. "In International Encyclopædia of Surgery" two cases are mentioned. One was that of a man, æt. 21,

who was struck by the bumper of an engine. He vomited and complained of great pain beneath the ribs. Next day bloody urine was noted, which gradually increased, so that great tenesmus of the bladder occurred from coagula in the bladder. A dull swelling formed in the left side of the abdomen, tympanitis and delirium supervened, and death occurred on the twenty-sixth day. The left kidney was found ruptured across the middle, and the lower segment crosssed transversely by numerous fissures. A large cavity was found surrounding the broken kidney, filled with grumous, offensive blood, clots and urine. In the peritoneum, forming the anterior wall of this cavity, there was a ragged rent in a thin slough, through which offensive serum was found to exude into the peritoneal sac.

The other case died on the 11th day, a tumor having been observed on the left side, with similar symptoms as in the previous case. The left kidney was found completely divided through the pelvis and the two halves widely separated by blood and urine, which reached behind the peritoneum as high up as the diaphragm and as low down as the insertion of the proas muscle on the femur. A kidney may become completely torn through, either transversely or longitudinally, there may be several small surface-tears, or it may be pulpified, as in my case.

The first and principal danger is the bleeding, which gradually may reach such proportions that strangling of the peritoneum from pressure occurs. If a large branch of the renal artery is torn, death may occur quickly. If the patient survives this danger, he stands an excellent chance of succumbing to a perinephritic abscess. Can you imagine a better chance for the development of a genuine abscess than a crushed kidney with a collection of blood and urine in the loose, fatty and easily destroyed tissue in the retroperitoneal space.

It is true that there are a number of recoveries from ruptured kidneys on record, the principal symptoms of which were homaturia, but, to say the least, it is questionable whether they were cases of ruptured kidney! Homaturia is not necessarily a symptom of ruptured kidney, occurring, as it does, from contusions, renal calculus, acute nephritis, etc.

On the other hand, a ruptured kidney may exist without hematuria, if the ureter becomes plugged by a clot or completely torn across, so that neither blood nor urine can reach the bladder. In regard to symptoms I can give no better description than that of Henry Morris, surgeon to the Middlesex Hospital in London.

"If after the abdomen has been run over or the person has fallen or

been struck on the abdomen or loin, faintness, coldness, vomiting and abdominal pains follow; if on the day of, or the day after the accident, and whether the catheter be required or not, the urine is found to con-tain a quantity of blood and bloodclot; and if after several days bloodclots continue to pass, or pus as well as blood is voided in the urine; if, moreover, there is pain along the course of the ureter, with retraction of the testis, or a rigid and prominent state of some of the muscles of one side of the abdomen, with frequent desire to micturate; or finally, if a tumor, dull on percussion, forms in the loin, or lumbar or hypochondriac region of the abdomen, accompanied or not with signs of local peritonitis—there are safe grounds for believing that either the kidney or its pelvis has been ruptured."

The prognosis, at best, is doubtful and the mortality great. Dr. Otis gives a statistic of 27 cases, of which 16 died; a mortality of 59%. Maas gives another of 71 cases, of which 34 died; a mortality of 48%. Both added together give 98 cases with 50 deaths; a mortality of 51%, all for subparietal injuries.

In compound injuries, by gun-shot wounds or penetrating instru-ments, the mortality is still greater. In the Medical and Surgical His tory of the War 78 such cases are mentioned, 52 of which died; a mortality of 67%. In none of these were operations performed.

When we, lastly, consider the treatment, then I believe that very little reliance can be placed in the usual administration of opium, ergot, astringents and cold applications, except in the lightest cases, which would probably recover without treatment. Considering that an exploratory incision of the kidney-region under antiseptic precautions is an operation absolutely devoid of danger, and that by no other means are we able to satisfy ourselves of the amount of injury done or prevent dangerous and fatal complications from occurring, I am strongly in favor, with Simon, of employing this method as a prelimin-ary step in all cases in which there are serious symptoms of ruptured kidney. If we should find the diagnosis wrong or the injury less than we suspected, no harm will have been done; if right, we are in a po sition to judge about the severity of the lesion and the means to be used in order to meet the dangers, be this ligation of ruptured arter ies, nephrectomy, if possible, in completely crushed organs, or simply, as in my case, removal of clots and blood, disinfecting of the cavity and packing with iodoform-gauze, leaving the wound open for drain-age and referring the question of nephrectomy to a future time.

That even in such a case nature can accomplish wonders and that nephrectomy may be superfluous, is well shown in this case.

THE MÜTTER LECTURES ON SELECTED TOPICS IN SURGICAL PATHOLOGY.

SERIES OF 1890-1.[1]

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LECTURE VI.

TETANY—TETANUS.

SYLLABUS. *Tetany.*—Definition and theories of its causation. Frequency after thyroidectomy. In the past has often been mistaken for tetanus. Semeiology and symptomatology. Researches concerning the thyroid body. Experiments with its extirpation and transplantation. Relationship of tetany to myxœdema and cachexia strumipriva. Acute mucin poisoning. Deductions as to the safety of certain operations on the thyroid.

Tetanus.—Consideration of the wounds, the wounded and their environment, when dealing with the subject. Class of wounds most often infected. Predisposing causes and circumstances of age, sex, color, climate and mental condition. Influence of weather and other conditions of locality. Tetanus hydrophobicus and tetanus neonatorum essentially the same as the traumatic form.

Theories as to its causation. Theory of its nervous origin. The humeral theory and that of its zymotic origin. Discovery of its specific microbe by Nicolaier, and confirmation and elaboration of his work by Kitasato. Description of the bacillus of tetanus. Discussion of its peculiarities and specific action after inoculation. Deductions as to possible treatment of the disease.

THOUGH tetanus and tetany are not merely similar in name, but present many characteristics which might lead to mistaking one for the other, there is, nevertheless, such a wide etiological difference between them that a clear differentiation is of the greatest importance, not merely for the

[1]Delivered before the College of Physicians, Philadelphia, December, 1890.

sake of accuracy, but for the credit of surgery and the welfare of an important class of patients, *i. e.*, those suffering from enlargements of the thyroid.

Both occur as sequels of operative interference, and if tetany is so infrequent as never to be seen by some, it may be experimentally produced and studied almost at will.

Tetany may be described as apparently a neurosis, manifested especially by tonic spasms, particularly of the extremities, and an increase of mechanical and electrical excitability of peripheral nerves. It is pathognomonic of the disease that these spasms may be produced by compression of one of the great arterial or venous trunks.

It was described first by Corvisart and Trousseau, and then more fully by Erb and Chvostek. It occurs spontaneously in less severe form in pregnant and nursing women, in children after exposure to cold, or after such intestinal lesions as may be produced by typhoid or by parasites; also among young apprentices to certain trades. It occurs also in endemic or epidemic form. But what interests us most here is that it sometimes follows certain operations, and extirpation of the thyroid in particular, and then constitutes so serious a complication that a large percentage of patients succumb.

It has been described under various names besides tetany, as, *e. g.*, tetanella, idiopathic muscular spasm, carpo-pedal cramps or spasms, etc. It is certainly a functional neurosis, comprising spasms of muscles in a pretty regular order or rythm. Patients do not lose consciousness.

It was considered by Herz to be due to spinal anæmia, while Jacobi, on the contrary, attributes it to meningeal hyperæmia, and Gowers explains it on the hypothesis of a primary lesion in the primary cells of the cerebro-spinal tract. While it is certain that its pathology and symtomatology are still obscure, it will be shortly seen that a notable advance in its experimental study has been recently made.

According to Weiss (*Ueber Tetanie*, "Volkmann's Samml. klin. Vort.," No. 189), it was noted as a post-operative phenomenon in Billroth's clinic. Later it was noted and remarked upon by Schönborn, Albert, Nicoladoni, Mikulicz, Gussenbauer, Corley, Szuman, Kocher, Kothman, Higguet and oth-

ers, and has recently been made the subject of a careful experimental study and an elaborate essay by von Eiselsberg (*Ueber Tetanie in Anschlüsse an Kropfextirpation*, Vienna, 1890), to which I am greatly indebted, and from which I have largely drawn.

The most striking characteristic about tetany is the peculiar severity or malignity which it exhibits when occurring as a sequel to thyroidectomy. Thus Eiselsberg refers to twelve such cases in Billroth's clinic out of fifty-three total extirpations, of which eight died, while in two the disease assumed a chronic character, and only two finally recovered. To its severity and its fatality is largely due the unfortunate confusion of terms and clinical pictures, by which so many deaths after total extirpation of the thyroid have been described as due to tetanus. It is of importance, then, to differentiate accurately between the two diseases.

The symptoms of post-operative tetany may supervene almost immediately after the effects of the anæsthetic have disappeared, or may be delayed so long as ten days. Usually prodromal symptoms give warning of what is coming; such as malaise and a combination of muscular weakness, with a sensation of muscular stiffness. Sometimes these sensations are quite absent and the outset of the disease is equally violent and surprising. Two signs which may be usually early elicited are so characteristic, so diagnostic, that they deserve great emphasis.

The first is Chvostek's. A slight tap upon the side of the face, over the point where the facial nerve emerges from the parotid, suffices to call forth a sudden spasm of that side of the face. The second—Trousseau's—is the spasm of an extremity, which may be produced by compression of its principal blood or nerve supply for a brief period of time, from a few seconds to a few minutes. The first sign is easier of production, is elicited without detriment to the patient, and is pathognomonic; while the second is of no greater value, and may be followed by pain, and its frequent repetition certainly does serious harm to the patient.

The muscles of the face are those commonly first affected; then those of the upper extremity; they are always more

marked in the arms than the legs, and sometimes the latter seem to escape. The position of the hands and fingers is usually that seen in cases of irritation in the course of the ulnar nerve; the elbow somewhat flexed, the hands flexed to the ulnar side, the fingers bent at the metacarpo phalangeal joints, thence straight and stiff, the thumbs bent into the palms. This position of the hand and fingers is not invariable nor pathognomonic, but is that usually seen. Sometimes the fist is doubled up with the thumb between the first and second fingers. The muscles of the forearm are hard, and sometimes a little tremor may be perceived. It is always difficult to overcome the muscular spasm. In severe cases the hands are usually held with their backs pressed together. When the lower limbs are affected the legs are usually stiffly extended, with strong plantar flexion of foot and toes. With all this muscular spasm there is more or less pain in the affected parts, with temperature usually considerably elevated. Such attacks may last from two to fifteen minutes or more, but they do not occur with nearly such frequency as the convulsive seizures of true tetanus, and it will be seen that there are other wide differences in the onset and march of the two diseases.

Nevertheless, in the most severe form of tetany there may be such contortion of the facial muscles as to resemble the "sardonic grin," and which would, of course, destroy the significance of Chvostek's sign. Tonic cramp of the abdominal muscles is not unknown, especially of the recti, and one may even see a certain degree of opisthotonos.

Dyspnœa may be caused by spasm of the diaphragm or thoracic rigidity, and cyanosis may be the result of cervical spasm. In some cases the patients give shrill cries; others speak with great difficulty. Deglutition is sometimes difficult. Finally in the gravest cases consciousness is lost; and usually at such times spasm relaxes. Death never occurs in the height of the disease, usually hours or days later.

Autopsy gives only negative findings; only twice Weiss found some slight disturbance in the gray matter of the anterior horns in the medulla.

Some peculiar features have been noticed in individual cases. Thus in one of Billroth's cases the patient was four

months pregnant at the time of the thyroidectomy. Normal delivery at term was in no wise interfered with, although for *nine years* she suffered from tetanic seizures, during which Chvostek's and Trousseau's signs could also be easily evoked. For the latter a very brief compression of the ulnar nerve sufficed. Overwork or excitement, particularly in cold weather, seemed to precipitate these attacks. Her temper appeared less equable than before the operation, and she was at times found almost uncontrollable. Before the operation, too, she had suffered spontaneous loss of hair and nails; these were afterward as spontaneously restored.

Another and younger woman recovered, but long remained subject to mild attacks, which occurred much oftener in cold than in warm weather. After a couple of years she had no seizures properly speaking, but the phenomena described by Chvostek and Trousseau could be elicited at almost any time.

Weiss has described (*Allg. Wiener Med. Zeit.* 1885, No. 37.) an atrophy of those groups of muscles most involved in the spasms, as a sequel of tetany, though not of that observed after thyroid extirpation. So also falling of the hair has been noted by Kocher (*Arch. f. klin. Chir.* 1883) as an accompaniment of cachexia strumipriva, and by English writers among the symptoms of myxœdema.

In one of the marked fatal cases, and in two of the others, a great temporary improvement was noted after a profuse sweating. Whether this might be of service as a hint in the therapeusis of the affection is a question worth considering.

It will be noticed that all of Billroth's twelve cases were females. Of the eight fatal cases, as detailed by Eiselsberg, I have tabulated the following information: (See table, p. 130).

Though so rare among males the disease is not unknown among them, since Mikulicz has reported two cases and Higguet one.

No treatment seemed to be of avail, and nothing seemed to mitigate the intensity of an attack. The internal use of chloral with the subcutaneous exhibition of morphia seemed most satisfactory. In view of a remark made above, I would suggest the expediency of trying pilocarpine as a diaphoretic.

When these and similar cases are critically studied it appears

that their ætiology is inseparably connected with the total removal of the thyroid. They were in no wise nor remotely septic. In the eight fatal cases above alluded to only once was there the slightest suppuration in or about the wound. So with the cases reported by others; wound disturbance of any kind was the rare exception. To be sure in the very few cases reported where pus has collected in the wound the violence of the symptoms increased, but pressure upon the scar at almost any time would have the same effect; and in other cases it was noticed that a constrained position in bed affected one patient in the same way, and in another, apparently about recovered, a warm bath precipitated a violent attack.

Age.	Attack Began, Days After Operation.	Lived How Long, After First Attack.
12	Fifth.	Three months.
18	First.	Three days.
39	Tenth.	One day.
64	Ninth.	Eight days.
17	Second.	Seven months.
23	First.	Three days.
36	Fourth.	Four days.
32	First	One month.

Injury to the recurrent laryngeal nerve does not explain these cases, since this nerve is practically always injured in these operations. We are confronted with the following most significant figures: After 53 total extirpations it occurred 12 times; after 11 partial extirpations it did not occur at all. It has occurred twice, once to Szuman, once to Billroth, to see mild cases of tetany after nearly complete removal of the thyroid body. The inference, then, is unavoidable that in some way, not yet understood, the removal of the thyroid

brings about the curious phenomena collectively termed tetany. *How* or *why* this is the case is a problem to be solved—if at all—only by experiment. This is made the more difficult by lack of exact knowledge of its function.

The names of A. Bardeleben, Schiff, Zesas, Colzi, Wagner, Albertoni and Tizzoni, Sanguirico and Canalis, Fuhr, Munk, Horsley, Carle and others less well known, have heretofore figured prominently in researches upon this organ. As the result of their labors it has been pretty well settled that in cats and dogs removal of the healthy thyroid provokes a constant diseased condition which is fatal; while sheep, rabbits and rats tolerate it without harm. Further, when it is made *a deux temps* the symptoms only appear after removal of the second half. Extirpation of a lateral half only is seldom provocative of disturbance, while Wagner, Horsley and Rogovitsch have seen a compensatory hypertrophy of the remaining portion. (Vid. Sutton's *Dermoids,* p. 83-4.)

Schiff went further and experimented with transplantation. It is now known that this peculiar organ, or ductless gland as it is often called, possesses tbe peculiar property of usually first quickly contracting adhesions in any new tissue in which it may be placed, and then later of establishing for itself an adequate vascular supply with, presumably, more or less restoration of its function.

Schiff claimed that when an animal, into whose peritoneal cavity the thyroid of another of its own species had been transplanted, subsequently had its own thyroid totally removed it did not develop these peculiar symptoms. But these results claimed by Schiff have been positively denied by others, and certainly need confirmation. At all events it seems pretty clear that dogs and cats very seldom survive removal of the entire thyroid, and that in those who do accessory thyroid bodies are found. It was Fuhr who especially determined this matter, to disprove the claims of Kaufman and Tauber; and he further showed that no amount of irritation of the recurrent nerve sufficed to provoke tetany—only total thyroidectomy would produce it. Horsley has shown that virtually the same obtains in the case of monkeys, who develop tetanic

symptoms and fall into a condition of myxœdema, in which mucin is found in considerable quantities in certain tissues and in the blood.

In order to better determine the influence of the thyroid relative to these peculiar nervous phenomena Eiselsberg made experiments on a series of 100 cats, having selected this animal because it seems to be free from accessory thyroids whose presence, by subsequent compensatory hypertrophy, might vitiate the results.

In one series he made total extirpation 17 times. Only once did suppuration occur, the other 16 wounds healing *per primam*. All these animals developed tetany; the youngest displaying its characteristic signs almost immediately after awakening from the narcosis, the others in from one to three days. All died of the disease. The symptoms in animals consist of tremors and muscular spasms which show themselves particularly as the creatures rise from the recumbent position or still more from the dorsal. Dyspnœa is frequent. Then tonic spasm of the extremities supervenes, and this can be produced almost at will by tapping the limb over the greater nerve supply. During pauses they are usually quiet and apathetic. They usually die in spasm. The course of the disease is usually about a week, but it may be fulminating and kill them in a day. Loss of appetite and rapid emaciation are conspicuous. The act of deglutition frequently provokes an attack. Free flow of saliva is often noted; during this there is sometimes temporary improvement. The limbs often assume rigid positions, reminding one of catalepsy.

Nine times total extirpation with transplantation was tried—once under the skin of the neck, twice under that of the belly, twice between muscles, twice in the peritoneum, and twice as Schiff did it. Seven times out of nine these wounds healed *per primam*. All nine died of tetany.

In 1887 Ewald reported (*Ber. klin. Wochschft.*, *1887*, *No. 11*) that after hypodermic injections of thyroid juice into healthy animals, some disturbance—lasting 1—2 hours—was produced. But according to Horsley this has no different effect from other tissue juices which contain some fibrinogenous poison. With this in mind Eiselsberg made five total extirpations, after

which a strong extract of the thyroid was injected under the skin, without any apparent effect. In two other animals he substituted a small dose of morphia, by which both animals were made more quiet, but all seven died of tetany. He then tried a fourth series of sixteen, extirpating only a lateral half. Two animals died of infectious pneumonia, the other fourteen all recovered, without any appearance of tetany. In eleven others the extirpated half was transplanted into the peritoneum, with the same negative result.

Twice he followed Schiff's experiments, and extirpated first one half and then the other, transplanting the second half into the peritoneum, and both animals died of tetany. Nine times this experiment was so varied that *the first half* removed was transferred, while the other half was extirpated from 3 to 21 days later. Eight of these animals showed perfect wound healing, but died of tetany; only one of these, an old and large animal, with a period of 3 weeks intervening between the two operations, recovered without disturbance.

These results correspond exactly with Carle's obtained on dogs. In four of this last series of nine cases it is noteworthy that between the first and second operations a considerable hypertrophy of the undisturbed half had taken place, and when this second and enlarged half was taken away, in each instance the tetany was of the fulminating variety. Only once out of four other cases in which the first half was transplanted between the peritoneum and its overlying fascia, did perfect fixation and organization—*i. e.*: vicarious restoration of function (?)—take place; the other three died of tetany.

Seven other experiments, by which more than half of the total thyroid mass was removed, seem to demonstrate that when four-fifths of this body is taken away, tetany is the almost inevitable result. In sixteen other animals vascular exclusion of the thyroid was made by ligation of all its vessels. All of these developed tetany, and all but four died of it; the four gradually recovered. When the two halves were thus excluded at intervals of six weeks, there was no apparent effect.

These numerous experiments certainly seem convincing though the obvious inference is not in accord with the views of Munk and Drobnik, who are disposed to regard the tetany

as due to irritation in and about the wound upon the large nerves closely adjoining, and who ascribe to suppuration the *role* of being the irritant factor.   It will be seen that 87 % of wounds in those animals which Eiselberg operated upon healed without suppuration, and that this union *per primam* did not seem to interfere with the onset of tetany.   Moreover, Horsley, Fano, Ewald and Weil have abundantly shown weaknesses in Munk's chain of argument, and have apparently disproved his contradictory statements, showing the fallacies of his reasoning and the inaccuracy of his methods.

Although it takes us away from our primary subject, which is rather a discussion of the ætiology of two diseases presenting certain points of resemblance yet widely different in pathogeny, still we may with profit consider for a moment what relation tetany, following thyroidectomy, bears to myxœdema and to cachexia strumipriva, following the same procedure. The two latter are eminently chronic maladies, while the former is essentially acute.   We are largely indebted in this consideration to the Myxœdema Committee of the London Clinical Society (Appendix to their Trans., 1883), and especially to Horsley's experiments upon apes.   This investigator saw sometimes a rapidly fatal tetany, which has been spoken of as acute experimental myxœdema, while in other cases there developed slowly the well known signs of the common form, depending very largely upon the temperature at which the animals were kept, since the colder the environment the more quickly they died, and with more acute symptoms.   In the first stage of myxœdema there is a marked increase of mucin secreted by the salivary glands, intestines and bladder, while on autopsy it is found in the blood and in abnormal quantities in certain tissues.   The influence of temperature is beautifully demonstrated in an instance reported by Horsley.   A sheep underwent total extirpation, and remained apparently well for twenty months; he was then, after shearing, exposed to cold, after which he developed acute symptoms and died a typical death.   From all of which it appears that tetany and myxœdema are, as it were, interchangeable diseases; dependent on the same causes, differing only in march and course.   It follows from this that the thyroid is an organ not only of pecul-

iar function, but that it is one of the most indispensable parts of our bodies. Of several hypotheses which have been advanced to account for its peculiar importance, that which seems best to explain the facts, and, indeed, perhaps the only one tenable, is that it has to do in some way with the transformation of mucinous substances which when allowed to collect in the system certainly are injurious and even fatal. As corroborating this view, we know a peculiar bronchial catarrh which these patients occasionally present, with its tenacious mucinous secretion; further that with the subsidence of this elimination the disease is commonly augmented.

Furthermore, that with profuse salivary or sudoriparous excretion amelioration occurs, and that when excretion is hindered, as by cold, the symptoms are at once changed for the worse. It appears that by such symptomatic discharges the flooding of the organism with mucin is prevented. Finally, the very common colloid, or, more exactly, mucoid degeneration of the thyroid body has a significance which must not be overlooked; as if, according to Eiselberg, when this organ can no longer bring about the proper conversion of mucin (or its allied substances) it collects it in reservoirs in the shape of colloid material, which is, at least, difficult of resorption, and so keeps it out of the economy.

These views gain credence also from the undeniable fact that excess of mucin is poisonous to the system, and this has been beautifully demonstrated by Wagner. He injected mucin which had been carefully extracted from the salivary glands of cattle, into cats, and produced thereby typical tetany.

The occurrence of idiopathic tetany appears to have much to do with meagerness of diet or improper nutrition. Neusser has called attention to a certain similarity between pellagra, as he studied it in Austria and Roumania, and epidemic tetany among school children. Each appears to be in no small measure an auto-intoxication brought about by unwholesome food. Most interesting and important in this connection is Gerhardt's discovery that tetany sometimes follows dilatation of the stomach, with its train of fermentative mal-digestive disturbances.

Obviously, certain difficulties present themselves in accept-

ing these views.   Why should certain animals display so vio-
lent manifestations after thyroidectomy, while other species or
genera are scarcely or not at all affected?   Why should the
carnivora belong to the former class, and the herbivora to the
latter, as to a large extent they do?

Beyond stating that the herbivora appear to be exempt
from the acuter manifestations, we can give no answer to such
questions unless it be found in the nature of their diet.   It is
of interest here that at least one patient who made a good re-
covery after thyroidectomy noticed a notable change in his own
appetite, since he reported to Eiselsberg that he had lost all
wish for meat and had become a vegetarian (loc. cit. p. 35, note).

Another query naturally arises here.   Why do some per-
sons to all appearances completely recover after thyroidec-
tomy, while others succumb quickly to acute tetanic manifes-
tations, and yet others fall into the most sad condition of
myxœdema?   As yet this can only be partially answered. Yet
it is known that in youth the thyroid plays a more important
part than in latter adult life.   It is also quite sure that when we
attack the thyroid it is because it is no longer in a physiolog-
ical but a pathological condition, and when we draw infer-
ences between clinical experiences and experimental results
we must bear this in mind.   Moreover, it appears safer, so far
as the disease at present considered is concerned, to remove
a cancerous thyroid than a goitre.   Moreover accessory or
supernumerary thyroids are frequently found, often at points
where they are difficult of recognition, as behind the larynx, at
the root of the tongue, etc., and when present they can of
course assume an importance begotten of necessity.   To this
I might add the possible assumption of function, in certain
cases, by such correlated tissues as the tonsils or other lymph-
oid tissues, or possibly even the bone marrow, although noth-
ing definite is yet known upon the matter.

Although it bears little if at all on the pathology of tetany
I deem it quite advisable here to introduce a very brief notice
concerning some recent and very important studies concerning
the curability of myxœdema, taken in the main from a recent
note in the *Therapeutic Gazette*, (Oct. 1890, p. 718).

Early in 1890, Mr. Horsley suggested that the disease might

be cured by transplanting healthy thyroid tissue into the bodies of patients thus suffering. But it appears he was forestalled in the idea by Bircher, who related certain valuable results obtained by this method. He described an acute case in a female patient from whom, unintentionally, the whole gland had been removed. Severe symptoms supervening, Bircher in January, 1889, transplanted into the abdominal cavity a portion of an apparently normal tissue from a goitre. The immediate effect was very happy and the patient returned to work. Three months later, however, it become evident that the transplanted portion had atrophied, as myxœdema again appeared and progressed. A second transplantation was then made with more lasting improvement, as the patient remained fairly well for nine months. At time of writing the symptoms had returned in very mild degree, but the beneficial effect was established indubitably.

In the *Brit. Med. Jour.* for July 26, 1890, Horsley reports that he had recently learned from Kocher, of Berne, that he attempted to obtain the same effect in 1883, by the same method, but that the graft was too soon absorbed. Further, that after hearing of Bircher's success, Kocher took up the subject again, in 1889, by transplanting, in two cases, half of a thyroid body into the abdomen, fixing it to the wall by sutures. In each case the gland was, after a time, "aseptically exfoliated." Then in three cases he put the gland loose in the abdominal cavity. The final results of these cases have not yet appeared, though at least one was greatly improved.

From these considerations Mr. Horsley thinks that the operation should be performed not only in cachexia-strumipriva, but also in myxœdema and sporadic cretinism. But whether the transplanted gland-tissue may better come from a human being or from an animal remains to be decided.

There is perhaps no *terra incognita* in physiology in which ingenuity of research and pains taking study may be better rewarded than that outlined in these few remarks upon tetany. It is a field wherein the interests of the pathologist, the clinician and the operating surgeon are common property, and he who properly harvests the seed already sown there may prove a benefactor to his race.

Etiologically the subject of tetany has nothing to do with
that which must next engage our attention, namely tetanus.
Yet. clinically they appear so closely related that those that
ought to know better confuse them.   Thus, I was informed,
while abroad last summer, by a more than ordinarily intelligent
physician that a well known European surgeon had lost so
many patients from tetanus after removing the thyroid that he
had been virtually forced to give up such operations.   It re-
qu'red some pains to elicit the facts in the case, which simply
were to the effect that he, like some others, had become dis-
couraged on account of the proportion of cases which devel-
oped *tetany* after total extirpation of the thyroid.   There would
seem, then, to be no impropriety in proceeding at once to a
consideration of some of the features of tetanus.

TETANUS.

Unlike tetany, tetanus is referred to in the oldest annals of
medicine.   One may find in Hypocrates, Galen and Celsus at
least some indication of its principal symptoms, but its precise
clinical history commenced with the end of the previous cen-
tury, with the observations of Bajou and the grand work of
Heurteloup which gives an excellent resume of the knowledge
of his time.   Fournier-Pescey extended this knowledge and
showed the possibility of recovery.   During the wars of the
Empire clinical facts multiplied and we were given the accurate
description of Larrey.   It has remained for the second half of
our own century to clearly discover the etiology and pathology
of this disease.

Following the example of Richelot, in his Thesis of
1875, and of Mathieu, in his article in the Encyclope-
dic Dictionary, we must speak successively of the wounds,
the wounded and the environment.   First of all, any wound
may present this complication, but some predispose more than
others.   The point of injury makes some difference.   Wounds
of the extremities, of the hands especially, seem more often to
determine trismus than any others.   Thus for Poland and for
Yandell more than one half of the cases are due to traumat-
isms of the extremities.   The character of the wound has been

alluded to by authors as occasioning a predisposition. Thus gun-shot wounds, espccially the lacerated and contused, and next perhaps the injuries received from machinery, seem to be the most grave. The most cleanly cut wounds seem to be the least often infected, although tetanus in the past has, not rarely, followed amputations. On theoretic grounds, referring to the parasitic origin of the disease, it is not difficult to un-derstand why it should more commonly follow ragged wounds. Burns, whether accidental or provoked by the actual cautery or by chemical substances, and frost-bites, whether superficial or deep, have also caused the disease, and as is well known, it frequently follows ligature of the umbilical cord in the new born. The extent and depth of the wound ; re features with-out importance. The prick of a needle, a hypodermic injec-tion, the bite of a serpent, the penetration of a thorn, the ex-traction of a tooth, piercing the ears for ear rings, vaccination, dilatation of the nasal canal, the removal of an in-grown nail, and other equally trivial accidents or operations have been followed by the disease. In the past such operative measures as the constriction of a nerve in a stump, or the ligature *en masse* of the spermatic cord, or of the pedicle after ovariotomy, have been forbidden for this reason.

The presence in the wound of foreign bodies, of bullets or fragments of weapons, of thorns, of needles, and of any other small foreign particles, seems to predispose toward the disease. It has been generally supposed that an actual break of the sur-face by which air might be admitted, was a prerequisite for the manifestations of tetanus, but evidence is very strong that this is not absolutely necessary. The well known case of Morgagni in which it followed a contusion of the back, and such a case as that reported by Verneuil where it was appar-ently produced by a violent effort to prevent a fall, as well as cases reported by Bouchut, Macleod and others, put this all beyond a doubt. Closed fractures and small luxations or dis-locations have likewise been followed by tetanus. A case has been reported by Richelot in which it followed the dislocation of a finger, and in which dissection revealed the nerves stretched over the dislocated extremity of the phalanx like violin strings. Such cases, therefore, are not so very rare.

Out of 121 cases observed by Wallace, in the Indies, 13 were of this character. Here also may be properly emphasized the fact that it may not occur until after cicatrization of a wound. Thus Cooper, Annandale, Larrey, Langenbeck and others have reported incontestable cases of this kind. I have myself seen, in consultation with Dr. Norton, then of Buffalo, a case of tetanus which resulted fataly, and which followed some weeks after complete healing of a tarsectomy wound, in an adult, made for the relief of club-foot. The patient had so completely recovered as to be up and about his work, when he was suddenly seized with the unmistakable symptoms of the disease.

The wounded individual is more or less predisposed according to circumstances of race, sex, age and constitution. The colored race are always more liable than the white. The negroes, Hindoos, Malayans and the islanders of Tonga and Fiji show a particularly unhappy disposition. That negroes are particularly liable was abundantly shown during our Civil War, and that the inhabitants of warm countries seem the less resistant is shown by the fact that in various European wars the Italians and the French have suffered more than the Russians and the Austrians. One ordinarily speaks of tetanus as a disease of adult life, yet infants are by no means exempt ; and in the tropics the trismus of the new-born has caused a high rate of mortality. It was said by one plantation owner that fully three-fourths of the infants born upon his plantation succumbed to the disease. In Jamaica, according to Fournier-Pescey, a quarter of the new born Negroes succumb within eight days after their birth, and in Mexico and in Senegal the proportion is at times equally great. The ulceration around the ligature of the cord, or the little wound inflicted during the rite of circumcision, are the common causes of tetanus among these new-born, although it must be admitted that their detestable hygienic surroundings and their excessive poverty are contributing causes.

Men are attacked much more commonly than women, doubtless because their occupations expose them to more injuries, especially in war, males being commonly ten times as liable, according to some of our best authorities,—except

where climate, as above noted, especially predisposes. This difference is the more remarkable since parturition with its difficulties, and sometimes the necessary operative interferences, should make the disproportion less striking. In fact, much less serious injuries in the female have been followed by this disease. Thus, it has been known to follow amputation of the uterine neck, dilatation of the cervical canal by sponge tents, removal of polypus and ovariotomy.

Military surgeons have generally insisted that the mental and constitutional condition of patients figured largely in the etiology of the disease. Soldiers when worn out by fatigue or suffering from the disgrace of defeat or with their emotions vividly affected from any cause, are apparently more liable to the disease. The excitement of a sudden call to arms, of sudden discharge of cannon, even the whirring of bullets during the night, have been said to cause a shock which appeared to determine an invasion of the disease. Still, in 1870, says Mathieu, the besieged in Strasburg, Metz and Paris were affected with emotions even more vivid than those of the besiegers, and yet these last suffered more from tetanus; and thus after Waterloo the allied armies were less attacked than were the French, and so too in our Civil War not a single case was reported in the Confederate army, while the Federal troops lost 505 men from this source. Furthermore, those with visceral disease seem to be more subject to the disease. Malaria has also been supposed to be a contributing cause.

The influence of the environment is by no means the least interesting factor in the present consideration. The effect of climate is indisputable. Tetanus is *par excellence* a disease of hot countries. Guinea, Antilles, Senegal, Ceylon and Java have a reputation above all others. Military statistics show the same thing. In 1813 in Spain the English suffered in the proportion of one case of tetanus among eighty wounded men. In the East Indies in 1782 this proportion was doubled. In the war in Morocco there was one case of tetanus to nine hundred and twenty hospital patients of Spanish, and one to fifty-six of African birth. Apparently it is not heat alone which determines this intensity, so much as the combination of heat and humidity ; still, quick variations of heat and cold,

such as warm days and cold nights, seem to exert a great ef-
fect.   The sudden fall of temperature after the battles of
Dresden and Bautzen, according to Larrey, caused a large
number of cases.   The electrical disturbances which accom-
pany violent thunder storms seem to exert an influence, as do
also cold winds saturated with moisture, like those which come
from off the sea or sweep down the valleys of large rivers.
Curiously enough the wounded who have been cared for in
churches have suffered more from this disease than those
cared for in any other way.   After the battle of Jena, tetanus
attacked especially the wounded who had been carried into
churches.   In 1870 after the battle of Sedan it was those who
were thus cared for during the combat and the following night
who were mostly attacked.

Verhoogen and Baert have recently published a memoir,
dedicated to the Royal Society of Medical and Natural Sci-
ences of Brussels, in which they cite at some length the en-
demic character of the disease in warmer climates, and in
which they show the occasional epidemic character of the af-
fection in man and even in some of the lower animals, and
they cite as among the most startling evidences of this charac-
ter the remarkable experience of Thiriar.   He was unfortun-
ate enough to lose by tetanus ten cases of major operations
before he determined the source of the infection to exist in his
hæmostatic forceps.   So soon as he thoroughly sterilized these
by heat he had no further undesirable complications.   If the
disease can be so easily conveyed by instruments, the same is
true of a midwife's scissors, and these latter may well be the
cause of the terrible fatality of tetanus neonatorum of these
same climates.   These writers call attention also to the indefi-
nite symptoms preceding the outbreak of the attack; the fe-
ver, the occurrence at times of epistaxis, the existence in
many cases of a cutaneous rash resembling that of erysipelas,
to the symptoms of kidney disease and the changes occurring
in the kidneys, and to the enlargement of the spleen, as being
all characteristic of the usual course of infectious disease.

The term *tetanus hydrophobicus* or *cephalic* tetanus has been applied to a some-
what peculiar manifestation of the disease first described by Bernard and Lepine.

When the injury by which the disease is provoked is located near the parts supplied by the cranial nerves the facial nerve has been supposed to be affected upon the same side; the lightest disturbance causes painful spasms of the neighboring muscles involved, and the pharynx and larynx, being virtually supplied by these nerves, when thus involved are so affected as to produce an intense dysphagia, with spasms of the glottis upon any effort to swallow even fluids; whence its misleading name of tetanus hydrophobicus. The poor patient suffering from these painful muscular spasms, which are provoked even by the sight of water or the thought of taking anything within the mouth, cyanosed, with spasmodic dyspnœa or temporary apnœa, presents a picture conforming well to the type imagined by the laity as that of a person in the last stage of hydrophobia.

Brunner has very recently experimentally studied this phase of the disease anew. He has determined that, in animals at least, the peculiar appearance of the face is due not to facial paralysis, but rather to a tonic tetanic spasm of muscles. This was made the more evident by a section of the facial nerve after appearance of this condition, whereupon it subsided at once. This is unquestionably the case also in patients thus affected, since it is impossible to understand how the parts supplied by the facial should be paralyzed while those supplied by the pneumogastric and hypoglossal should be thrown into violent spasm. (*Deut. Zeit. f. Chir.*, xxx.)

With regard to the etiology of tetanus, two theories have in the past had their strong advocates, or perhaps, to express it more accurately, the explanations that have been offered in the past can be best grouped under two distinct headings, as first the nervous theory, and second the humoral. The significance and intensity of the principal phenomena of tetanus have always pointed us so distinctly to the nervous system as the most active agent in the production of the disease, that it is not at all strange that the primary irritation has been located in some part of this system. Under this heading, however, must be ranged such explanations as that given by Forbes, who attributed the poisoning to a successive production of creatin and lactic acid, in consequence of exaggerated tissue degeneration; this latter he considered due to excessive nervous activity, and this last he left unexplained. Such an hypothesis as an ascending nervous irritation due to lesion of the peripheral nerve filaments, is, perhaps, the simplest that would offer, and has had numerous adherents in the past. Besides this, there have been many who regarded the disease as due to an excitation of the spinal cord, and by this have explained the increased temperature, the tendency to asphyxia, and some of the other phenomena peculiar to tetanus. According to Brown-Sequard, it is a pathological reflex, having

for its point of departure a peripheral nervous irritation, caus-
ing an undue functional activity in the superior portions of the
medulla, which is followed by muscular contractions and elev-
ation of temperature.

So far as the microscopic changes in tissues are concerned, there is much differ-
ence of opinion among authors. Rokitansky and Demme have discovered changes
in the neuroglia of the white matter in the spinal cord, which, however, Leyden
does not consider to be pathological. Other authors like Clarke believe in conges-
tion and softening of the grey matter, Dickinson in changes in both white and grey
matter; while Lepelletier thought to have discovered a peripheral neuritis in these
cases. The most exact observation of the nervous system of patients dying of
tetanus, as well as of animals in whom the disease has been produced, do not reveal
any changes, either in the central nervous system or in the peripheral. Nevertheless
the whole course of the disease indicates a slow spread along the course of these
nerves. The poison, whatever it is, probably reproducing itself in nerve substance
spreads slowly toward the spinal cord, there to manifest its strongest activities.
Elevation of temperature is by no means constant in experimental animals, it is sel-
dom manifested. The exaggerated frequency of pulse is ascribed to a paralysis of
the vagus.

On the other hand, the humoral theory has had its defend-
ers, who have found plenty of facts upon which to base their
views.   According to these the alteration of the blood, which
they have considered the exciting cause of tetanus, has been
compared to poisons with various alkaloids, many of which
are known to exert a selective influence on various organs or
tissues. Defended especially in the past by Simpson and
Travers, and more recently by Roser and Billroth, it supposes
a specific toxæmia of the system, the unknown poison exert-
ing a selective influence upon the nervous system.   Others
have regarded it as a toxæmia, due to poison generated di-
rectly in the wound, or to an autochthonous septicæmia, due
to a sudden suppression of the functions of the skin, and the
failure to eliminate its excretory products.   The poison was
supposed to be a chemical one, formed in the wound or near
it, and thence absorbed into the blood.   If this hypothesis
were true we should have an evolution of the disease analo-
gous to that of purulent inflammation.   Quite recently, and in
accordance with the tenets of the germ theory, the idea of a
purely chemical poison has been abandoned, and the chief
role assigned to micro-organisms.   Before the parasitic nature

of the disease had been carefully recognized, Lister furnished a comparative proof of the truth of this hypothesis by showing how in six years under the antiseptic method, he had met with but two cases of tetanus, and these in wounds already septic.

Others yet have charged it with being distinctly a zymotic disease, which view had much in its favor, except the fact that until recently inoculation experiments had failed. Of course while each particular hypothesis under both the above headings had more or less in its favor there were objections which were fatal to each except to the last. For this last, namely that of zymosis, there were many corroborative facts, such as the statistics from the Dublin Lying-in Hospital, where there was at one time an epidemic of tetanus neonatorum; the mortality rate within the first fortnight being 17%, which was reduced to 5% after a better ventilation was established.

It has remained, however, for living observers, working within the past decade, to establish clearly the parasitic nature of this dread disease, and to isolate and investigate the organisms by which it is produced. In 1884 Carle and Rattone inoculated rabbits with an emulsion formed by macerating in distilled water a fragment of skin taken from a subject dying of lockjaw. Their results were positive. From them they concluded tetanus to be an infectious disease, but they could neither see nor cultivate the micro-organism which caused it.

The mere establishment of this fact was a very distinct advance in our knowledge of the natural history of the disease, and though some of their statements with regard to the biology of the micro-organisms which cause it, are hardly to be accepted, we, nevertheless, owe the above demonstration to them. During the year following Nicolaier demonstrated that in the ordinary soil of our gardens and streets there are bacteria which, when introduced under the integument of mice, guinea-pigs and rabbits, produce a typical tetanus with fatal termination. Inoculations made with dirt from the streets of Berlin, Leipsic and Wiesbaden gave the same results. Soon after this Rosenbach demonstrated to the German Congress of Surgeons (in 1886) that the same bacillus which Nicolaier described appeared in human tetanus, and soon after this his observations were confirmed by numerous observers.

In his communication to the Congress of Surgeons, Rosenbach first called attention to the fact that experiments had been made in a promising direction by Rose, Frickenhaus and by Arloing and Tripier, and that the latter had experimented in 1870 by injecting dogs and rabbits with blood and pus from tetanic patients, and had also vaccinated healthy horses with the blood of those suffering from this disease, but with negative result. He had himself injected into a dog 60° cc. of blood from a patient with tetanus, also without result; while Schültz and Billroth had done virtually the same thing, yet always ith negative result. This was now explained by the fact that all these experimenters used dogs, which are known to be refractory to the disease. It was then that Carle and Rattone succeeded as mentioned above. They injected into 21 rabbits an emulsion made from the pus of an acne pustule, from which a fatal tetanus had developed, and they introduced it into the sciatic nerve sheath. Eleven of these animals died of tetanus. They recognized the fact that the pus so injected was swarming with micro-organisms, but had no success with cultivation experiments. It was in 1886 that Rosenbach made his first inoculation experiments by introducing a small piece of skin from the neighborhood of a wound of a patient dying of tetanus underneath the skin of guinea pigs and saw tetanus develop in each animal within a few hours. Similar experiments with skin from a part at some distance from the poisonous wound had no result. It was evident, therefore, that inoculation succeeded only with material taken directly from the infected spot. He succeeded also in transmitting the disease from animal to animal. These experiments agreed with those of Nicolaier, who got his material from black earth. Socin, Polaillon and Jeannel imitated him successfully, and Hochsinger and Bonome verified his experiments, as also did Shakespeare, of Philadelphia Lumniczer has multiplied these experiments and made a precise study of the baci lus of which we shall speak very shortly in some detail.

It will be seen from the above statement why writers in the past have with reason spoken of the telluric origin of tetanus. Quite recently in Paris Verneuil has strongly defended what may be called the equine origin of tetanus, according to which the earth which causes such lesions and which contains the tetanogenic germs is especially that which has received the dejections of the horse. Tetanus is known to occur very frequently among grooms and those who care for these animals, and falls from a horse and horse kicks are frequently alleged causes of the disease. (Horse dung seems especially suspicious material). It is least common of all among sailors, but when happening among them occurs almost exclusively on board ships used for the transportation of these animals. Numerous reported instances lend a certain degree of plausibility to these views, and they are entitled to at least respect, if not to complete credence. Within the past few weeks I have been called to attend a lad who was caring for a horse that

had developed a typical case of tetanus, but recovered there-
from.   Before the horse was well the boy ran through the sole
of his boot a rusty nail which projected from the floor of the
shed in which this horse was kept.   In just one week he de-
veloped the symptoms of tetanus and died within forty-eight
hours.   Of course it would be folly to think that the horse
generated the germ or the poison, but the coincidence is cer-
tainly striking.   All the specially infectious bacteria have
their favorite soil; those of typhoid and cholera are found most
often in water; those of suppuration about the skin and hair,
and it is not difficult to admit at least that the germs of tetanus
abound especially around the horse.

It is hardly necessary to detail the minutiæ of Rosenbach's experiments. He
found, as has every other observer, that the symptoms proc ed in almost every
instance from the point or part affected; that if it be in a limb that the poison was
first introduced this limb is first involved in spasms, and that the so-called tetanus-
hydrophobicus could be produced when the inoculation was made about the head or
face. Examining the material with which he inoculated, he found a mixture of
numerous forms, staphyl cocci, streptococci, diplococci, large and small bacilli, with
and without spores. As one among these many forms he recognized the bacillus
described by Nicolaier, but his best endeavors to make a pure culture of the specific
organism failed. He even discovered that it or its spores were not destroyed by a
temperature of 100° C. after five minutes exposure, and although by thus heating he
killed off all or nearly all of the other organisms, he was still unable to make a pure
culture of the one he was after.

It has remained for Kitasato to isolate, to cultivate and to
study the organism in all its biological and pathological rela-
tions, and while he is not the discoverer of the organism, we
owe to him mainly what we now know about it.   He first
worked with the pus from a patient dying three days after the
onset of a typical tetanus, as well as with fragments of the
splinter which caused the injury.   In this material he found
three forms of obligate anærobic bacteria, five facultative an-
ærobic forms, and seven ærobic.   The principal difficulty of
course was to separate from these the particular organism
which he wanted, and he succeeded by a method which those
who desire to identify this organism will hereafter have to fol-
low.   He placed the mixture upon agar or blood serum, and
then kept this in the thermostat at 38°C. for forty-eight hours,
during which time the tetanus bacilli were stimulated into a

free formation of spores. The culture tubes were then placed in a water bath which was kept at 30°C. for from three-quarters of an hour to an hour. By this heat all the other organisms were destroyed and only the spores of the tetanus bacilli were left active. Inoculations of this into mice provoked the disease as typically as ever. He then planted these spores in gelatine and agar and cultivated them as anærobes in an atmosphere of hydrogen at a temperature of 18° to 20°C. And so by fresh refinements of technique which need hardly to be mentioned here he established that the tetanus bacilli might be cultivated in pure form, and that they grew as obligate anærobes with spore formation, their spores being extraordinarily resistant in the matter of temperature.

They are not necessarily killed by exposure to the air but grow only when the atmosphere is excluded. Under hydrogen they grow luxuriantly; under carbonic dioxide, not at all. The agar or gelatine in which they are planted must be very slightly but positively alkaline. They fluidify the gelatine with very slight formation of gas. If to the gelatine or agar 2% of sugar be added, their growth is more rapid, and it is even more so if to the culture material 0.1% sulphindigotate of sodium be added. They can even be grown in alkaline bouillon if hydrogen be present; they then generate a peculiar odor as if something were burnt. They can be cultivated from one generation to another without losing their virulence and without necessity for frequently passing them through animals. They may be grown on plates under hydrogen, but are ordinarily cultivated along the needle streak which very slowly, if at all, reaches the surface. They grow most rapidly at blood heat, very slowly at 20° C., but below 14° C. they do not grow at all. At blood temperature they form spores within 30 hours.

They have three principal phases of existence, *viz.*, a spore stage, a bacillus stage and a spore-bearing stage.

As grown in gelatine at ordinary temperature, they form separate bacilli, or gather in long threads. Where they form spores at higher temperature the spores are round and met with at one end of each bacillus, so as to give it a peculiar hat-pin or drumstick shape. It stains best during this shape. They possess a very slight motility, which is better demonstrated on the warm stage. Bacilli which contain spores, apparently have no proper motion. They take the ordinary aniline colors well, and may be stained by Gramm's method. The spore formation can be demonstrated to advantage by Ziehl's method of double staining. The bacillus seems to multiply by fission as well as by spores.

It is most interesting and important to know that the spore bacilli when dried by the ordinary method and then kept for

some days in an exsiccator over sulphuric acid, and then
kept in ordinary atmosphere, preserve for months their viru-
lence, and that their spores were found still acting by Kitasato
after having been mixed with earth that had been sterilized in
a steam apparatus for 10 hours. Evidently, then, tetanus
spores are extremely resistant. Moist heat for an hour does
not kill them, and, as Rosenbach had previously found, even
five months' exposure to moist heat at 100 did not destroy
them. Ten hours' exposure in 5 % carbolic acid left them still
virulent; only after fifteen hours could they be thus destroyed.
So also it took three hours' exposure in a 1 % sublimate solu-
tion, or thirty minutes in the same solution to which had been
added 0.5 of 1 % of hydrochloric acid. To other chemicals
they are equally resistant.

Kitasato left standing for two days a bouillon culture which he shook up with
10 cc. of chloroform. After the chloroform had been removed he injected several
animals with the culture and found it pathogenic as ever, while fresh culture grew
luxuriantly. When subcutaneously inoculated, small animals develop tetanic
symptoms within twenty-four hours and die usually in less than seventy-two.
Pigeons appear somewhat liable to the disease. It is evidently quite unnecessary
that any foreign body should be introduced along with the active germs, as would
perhaps appear from a study of the well-known features of the disease. Ordinarily
there is no local reaction at all, and on a section when a splinter has been used, one
finds it embedded in a mass of leucocytes without other disturbance.

It is to be emphasized that the symptoms of tetanus are al-
most invariably at first local, the muscles being first involved
at that part where the inoculation was practiced. It is further-
more noteworthy that by the microscope these organisms are
never found at any distance from the wound, and that, more-
over, even here they perish within less than twenty-four hours,
except as they may be found in the pus. Most careful exam-
inations of the brain, the nerves, the muscles, the viscera and
even the blood fail to reveal the slightest trace of them, and
inoculations practiced with these tissues or fluids are almost
always without results.

It is also of great interest that only tissues from the imme-
diate neighborhood of such a splinter are infectious, and that
inoculations with blood, brain, nerves or other organs of the
animal have never caused the disease. Possibly in the above

fact we may find an explanation of some of the cases above referred to, those of the disease supervening long after the healing of a wound, since the period of incubation in man is known to vary within wide limits.

Such a case has indeed been reported by Renvers from Leydens Clinic. Deep in the sole of the foot was found a splinter of wood an inch long. Inoculations with particles from this splinter succeeded, while those made with tissue only 3 millimetres distant from it produced no disease.

Kitasato trephined animals and then inoculated the dura with a pure culture, but after their death was unable to find the slightest trace of the bacilli in the brain tissues or in the blood; while culture experiments with the same all failed. These statements are somewhat at variance with those made by some earlier experimenters, yet they appear to bear the stamp of certainty, and have been corroborated by many other investigators. In order to demonstrate their action still further Kitasato practiced inoculations as before, which were followed within half an hour to four hours by excision of the inoculated area and cauterization of the wound thus made with the actual cautery. The animals died just as if nothing had interfered with the virulence of the disease.

Repeating these experiments several times, I have myself obtained the same results. Although it has seemed to me as if the onset of the symptoms were somewhat postponed and the progress of the disease somewhat delayed. The rapidity with which all bacilli vanish from all the tissues and juices of the body is perhaps the most astonishing feature of the disease. Presumably they generate a poison whose effects are far-reaching, and this poison has been studied by Kitasato and Weyl, who have very recently published a further communication upon the subject. The conclusions arrived at by Kitasato are briefly as follows:

1. Tetanus is a specific disease.

2. The active agent in producing it is a bacillus which is identical with that described by Nicolaier and later studied by Rosenbach, and now determined to be an anærobic organism.

3. This bacillus is found in the pus from tetanic patients and

animals. It often forms spores in such pus, nevertheless may be frequently met with while free from spores.

4. It is possible to cultivate this bacillus from such pus, and with pure cultures of it to reproduce tetanus in animals.

5. The somewhat contradictory statements of early observers find their explanation in the fact that tetanus is met with in various stages, and that the more quickly the animals die from the disease, the more likely are we to find spores in the bacilli. But these bacilli are, or have been, always present, and from them one can always cultivate spore-bearing decendants.

A consideration of the specific factors involved in tetanus, is inseparable from that of the toxines or ptomaines which they produce. During the period intervening between the time of inoculation, and the first symptoms of the disease, there probably occurs a gradual increase in the numbers of the micro-organisms, while there is slowly elaborated an increasing amount of those toxic substances. These are at first eliminated probably by the skin and kidneys as rapidly as formed, but they finally accumulate sufficiently to display their activities, first upon the nervous system, and later by the usual symptoms and signs of the disease as well known. It is corroborative of such view that the administration of full doses of pilocarpine in the early treatment of the disease is followed by benefit. The common treatment of the disease as well denotes the same, since the chloral so often given tends to lessen the recognition of afferent impulses, and the bromides to decrease the force of the motor explosion following. (*Med. News.*)

Since Kitasato published his first formal paper in the *Zeitschrift f. Hygiene*, he and Weyl have made three communications upon the ptomaines or poisons by which the bacilli produce the symptoms of tetanus. As is well known Brieger isolated from cultures of tetanus bacilli a crystalline material which he named tetanin. Working with the hydrochlorate of this alkaloid the above observers demonstrated that it produces in mice spasmodic disturbances, and increased flow of saliva.

Another analogous substance separated from cultures in the same way has been called by Brieger, tetanotoxin. Their experiments with this material produced results which were also analogous, and yet it appears from their work that the dose of either of these alkaloids must be relatively so great that one is forced to the conclusion that the tetanus bacillus in the living organism produces a poison of much greater virulence than

either of these yet isolated. They promise further studies and the publication of their results.

The investigations of Dr. Shakespeare, of Philadelphia, also deserve mention here. He was able by placing in contact with the central nervous system of healthy rabbits infusions of the spinal cords of tetanic cases, to speedily produce characteristic symptoms of the disease, while the subcutaneous injection of the same material had no effect. Although during his experiments he failed to discover specific micro-organisms, he nevertheless showed what has been demonstrated in another way by others, that the exclusion of the tetanogenic spores by extirpation of the infected sore, or by amputation of the limb in which it occurs, with distinct failure to arrest the disease, confirm the idea of local activity, combined with the elaboration of poisonous matters circulating in the blood. (*Med. News*, Oct. 25, 1890.)

Among very recent experiments concerning tetanus are those of Babes and Puscariu. (*Centrablt. f. Bakteriol*, VIII. No. 3.)

They worked with cultures received from Kitasato as well as with those which they isolated from horses suffering from the disease. From those animals which died as a result of inoculations, only the bacillus from the point of inoculation could be cultivated, but nothing from the veins, or internal organs, nor from the b ain or spinal cord. Nevertheless, mice and rabbits which received small doses of these fluids died from some poisoning without tetanic symptoms.

For purposes of experiment, two mice and two rabbits were inoculated with emulsion of brain tissue from a rabbit dying with tetanus. The former died in four days, the latter in eight, without symptoms of tetanus. In the endeavor to discover or invent a protective injection, these experiments were repeated and the emulsions were made with bouillon in different strengths, but the animals nearly all died.

Babes prepared an albumose out of agar cultures which did not contain peptone, whose watery solution was passed several times through a Chamberland filter. This substance sometimes, but not always, produced tetanic symptoms with cramps and paralysis, and fatal results after varying lengths of time.

Tizzoni, Cattani and Baquis have investigated three cases of tetanus, from which they isolated five different forms of bacteria, of which two only were pathogenic. The first of these seems to be identical with that described by Kitasato. The second was recovered from the blood and spleen of an animal dying after subcutaneous injection of specific pus.

It was also a bacillus smaller than the other, having involution forms and producing spores. It also showed itself to be anaerobic. After subcutaneous injection, typical tetanus was produced in most of the smaller animals. These authors were not able to deny, however, that this organism might not be identical with Kitasato s.

They claim that both of these bacilli lose somewhat of their virulent power with time and peculiarity of culture medium. They, like Kitasato, found no protection from excising the point of inoculation. (*Zeigler's Beiträge*, vii, 4.)

A recognition of the minute causes of tetanus raises the question as to what can be done for the disease. Evidently the bacilli themselves remain at the point where first introduced, while the poison which they produce circulates. Numerous observations seem to prove that this poison can be antidoted by reasonably strong solutions of various antiseptics; 5% carbolic solution, or 1% of nitrate of silver, or bichloride of mercury destroy the germs in the culture tubes; so also does exposure to steam for five minutes. The German writers seem to have confidence in iodoform when packed into the wound. The anærobic organisms, to which these bacilli belong, have a powerful reducing action, and are therefore capable of splitting up iodoform and of producing iodine in pure or nascent condition. In experiments upon animals, 10% solutions of iodoform in ether applied to the point of inoculation within an hour afterward have sufficed to prevent the development of the disease, but all experiments go to prove that whatever is done must be done within a very short time after the inoculation. The uselessness of amputation in well marked cases is very plain from the above experiments, as well as of any other destructive or mutilating operation. The method by incision recommended by Bilguer, by which air was freely admitted to the tissues, has in it something to recommend itself. Of course the very earliest possible removal of the foreign body should be effected. Military experiences show that recovery has sometimes followed the removal of the irritating substance. Isolation, nutrition and stimulation, with such drugs as may control symptoms, sum up the internal treatment of these cases.

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INDEX OF SURGICAL PROGRESS.

GENERAL SURGERY.

I **Upon Catgut Infection.** By C. BRUNNER (Zurich). Brunner discusses the manner of manufacture of catgut and the methods of preparation and preservation for surgical use. He points to the fact that Reverdin first taught the method of sterilization by dry heat and obtained an excellent result. Published instances of catgut infection by Kocher, Zweifel, Volkmann and others are referred to, these being entirely due to catgut prepared by carbolic acid oil.

In answer to the question addressed to many surgical and gynæcological clinics regarding experiences with catgut, invariably favorable replies, particularly with reference to sublimate catgut, were returned. During the past four years, in the Zurich clinic, a careful search has failed to reveal any complication that could be referred to this material. This included herniotomies, laparotomies and extirpations of the thyroid body. Similar experiences were gleaned from the work of Sanger, Crede and Caruso in the use of catgut as buried uterine sutures in Cæsarean section.

As to the absorbability of different methods of preparation of catgut, the author agrees with Bruns that in case of suppuration more rapid disintegration of this material occurs, while in other cases, or those pursuing an aseptic course, an essential difference is to be observed. All methods of preparation lessen the resistance of the catgut in the tissues as compared with raw gut; this is less observed in the chromic acid methods of treatment, as well as that of Reverdin.

The second portion of Brunner's article is taken up with an exceedingly valuable contribution to the bacteriological study of catgut in its surgical relations.

In examining catgut from different sources, and kept for different

lengths of time, it was shown that the sublimative disinfection as car-
ried on in the factories was such as to render the material absolutely
and permanently free from germs ; Reverdin's catgut likewise proved
itself to be without exception sterile.   Catgut prepared in carbolic
acid, chromic acid and in juniper oil was found, not infrequently, to
contain micro-organisms, although, indeed, these were not of a patho-
genic character.

Brunner directed his attention particularly to methods of sterilization
which should guard against anthrax infection.   Catgut known to be
thus infected was employed.   As a result of this he holds the follow-
ing method of preparation to be the best :

Raw catgut is thoroughly scrubbed with a brush and potash soap,
and then directly, after a half hour's exposure to ether, where it
should remain for 12 hours in a 1·1000 watery solution of sublimate.
It is then preserved in sublimate 1 part, alcohol 900 parts and gly-
cerine 100 parts.

Experience does not seem to have supported the observations of
Kocher regarding the applicability of silk as material for ligature in
place of catgut.   Those who have followed the warning of the latter
surgeon and have substituted the former for the last named material
have very soon discovered this fallacy and have been obliged to re-
turn to catgut.   The same may be said of those who have found re-
fuge in linen thread as a substitute for catgut.   Although such substi-
tution may at first sight appear to be a simplification of the antiseptic
apparatus, yet it really is a backward step.—*Beitrage zur klin Chirg.*
Bd. vi.

II.   Bacteriological and Critical Researches upon the
Manufacture of Catgut.   By Dr. E. Bratz (Heidelberg).   In
the first place Bratz calls attention to the presence of fat in catgut;
and points to the absolute necessity for the removal of this before any
antiseptic agent can exert its free influence upon the material.   He
then criticizes Brunner's researches, particularly with reference to
those experiments which point to reliance upon the destruction of
the bacilli of anthrax, which are easily destroyed, and not upon the

·sterilization of the spores themselves, which is much more difficult of accomplishment. Futher, according to the recently published observations of Geppert, all antiseptic substances which have been introduced with the substance of the catgut should be precip¹tated or neutralized in order to draw proper conclusions regarding the germicidal value of the particular procedure under trial.

Catgut contains about 1 5% of fat. Ether is the best means of removing this. Sterilization is best accomplished by means of the dry heat process of Reverdin (3 hours' exposure to a temperature of 140° ·C.). A special oven with double walls filled with oil, with the thermoregulator of Reichert, is recommended for this purpose. The further preservation of the gut is carried on in alcohol.

Bratz concedes that raw catgut, as heretofore procured, has been comparatively free from germ infection ; a rational method of sterilization is indicated, in spite of this relative immunity, however.

Bratz further proposes to expose raw catgut from 1 to 2 days in ether, in order to remove its fat, and to then immerse for 24 hours in 1·1000 solution of sublimate. It is then preserved permanently in absolute alcohol : or, as before suggested, to sterilize by means of ·dry heat, after Reverdin, and preserve by means of absolute alcohol. — *Beitrage zur klin Chirg.*, bd. vii.

Geo. R. Fowler (Brooklyn).

III. On the Antiseptic Action of Salol. By Dr. F. Papuli (Naples, Italy). The author experimented with salol as an antiseptic and deducts the following :

1. Salol has pronounced antiseptic properties, especially against certain micro-organisms.

2. Its antiseptic action is due to its decomposition.

3. This decomposition is produced by the micro-organisms themselves.

4. All micro-organisms decompose it ; but, those which decompose it the most actively lose their vitality, while those which only partly act upon it become attenuated and, finally, those which influence it but slightly remain active.

Finally, salol has an important influence upon suppuration. Al-

though this was well known in medical practice, as, for example, in cystitis and pyelitis, as well as in surgery, these experiments would seem to present a clear explanation of its favorable action. While all the writers in their publications speak in general of an antiseptic action and Gratzer of a detersive and exsiccating influence, from experiments, one comes to the conclusion that the antiseptic action of salol upon suppuration consists in the property which pyogenic micro-organisms have in decomposing it and remaining inactive after its de composition Its action upon the surfaces of wounds may be considered as double ; the salol in the inferior stratum decomposes and renders the cause of suppuration powerless ; while, in the superior, salol being like iodoform insoluble, it protects the wound from external agents, remains unaltered in the secretions of the wound while those secre tions which contain micro-organisms are disinfected.—*Rivista Clinica e Terapeutica*, 9, 1890.

<div align="right">A. PICK (Boston).</div>

IV. Pyoktanin and Peruvian Balsam in Surgical Practice. By DR. VLADIMIR A. TILE (St. Petersburg, Russia). The author, house surgeon to the Krasnoselsky Military Hospital, details his experience of the new antiseptics, coming to the following general conclusions: *A.* Pyoktanin. 1, When used in the shape of a 1 to 1000 solution, the substance actually proves to be a reliable disinfect-ant, but at the same time gives rise to considerable local pain and in-flammatory reaction, as well as to a general systemic disturbance. 2, In weaker solutions the drug is altogether useless. 3, The only advantages of pyoktanin consist in, *a*, its being free from odor, and, *b*, decreasing discharges from wounds. *B.* Peruvian Balsam. 1, It does not produce any impression on ordinary wounds. 2, But it invariably secures excellent results in cases of tubercular ulcers. Under the influence of gauze tampons, soaked in the substance, the discharge steadily decreases, its quality improves, bleeding and erethic granulations disappear and the lesion rapidly heals, while the patient's general state undergoes a distinct amelioration. 3, To obtain all the effects, however, the tampons should be frequently changed, and, besides, carefully applied in such a way as to keep them in contact with the whole ulcerated surface.—*Vratch*, No. 50, 1890, p. 1146.

V. On Blue Suppuration. By DR. M. M. KUZNETZOFF (Kharkov, Russia). The writer, house-surgeon to Prof. W. F. Grube's clinic, contributes a valuable monograph on the question, embodying his own clinical observations and bacteriological researches (in Prof. V. P. Kryloff's laboratory). The first case, which came under his notice in the said clinic, referred to a Cossack, in whom, shortly after a total excision of a scapula (on account of sarcoma), the discharge suddenly assumed a blue greenish color. A few days later the same phenomenon was observed in two other male patients, his neighbors in the ward, while a fortnight aftewards the "blue suppuration" spread to female wards. In all, 18 cases of the kind occurred in the course of two consecutive academical years. The discoloration appeared always quite suddenly, to persist, as a rule, for a more or less prolonged period, until certain special measures were adopted, after which it gradually ceased. The color of the discharge and dressing varied between a grass green with a yellowish hue, and a beautiful emerald-green. In some cases the whole dressing (gauze and cotton wool) was found to be dyed more or less equally and richly, while in others only isolated palish spots could be detected, the superficial layers being invariably thickened most intensely. Usually, the macerated cuticle of the wound's edges would also assume a bluish-green color, the staining penetrating down to the deeper strata of the horny structure. In 15 out of 18 patients the appearance of blue suppuration was accompanied by a rise of the systemic temperature up to 38° or 38.7°C., while after the discoloration having been removed by means of a thorough disinfection, the temperature returned to the standard. In such febrile patients the blue staining reached more intense degrees than in the other 3 cases in which the temperature remained normal. In every one and all of the author's cases there was present a quite peculiar (specific) sweet and aromatic odor about the dressings and wound which resembled that of blooming bird cherry, and was dependent upon the presence of pyocyanin. The essential corollaries drawn by the writer from his investigations may be given somewhat as follows: 1, The so-called "blue suppuration" is caused by two different species of chromogenic aerobe bacteria—by Ledderhose's *bacillus pyocyaneus* (Ernst's *C, pyocyaneus B.*) and *bacillus pyofluorescent* (Ernst's

C. pyocyaneus X.), which occur either simultaneously or separately. The discoloration of the discharge depends upon pyccyanin, a pigment substance, elaborated by the microbes, and partly upon pyoxanthose, which constitutes a product of oxidation of the former body.   2, In animals (dogs and rabbits) subcutaneous injections of either of the microbes ("pure cultures") are followed by local infiltration, inflammation and suppuration   On injecting large doses there also supervene anorexia, general prostration, diarrhœa, and intense fever, the case fre quently ending in death.   3, Intraperitoneal injections of the cultures give rise to hæmorrhagic, fibrinous, general peritonitis, always terminating lethally.   4. Intravenous injections produce an acute disease, characterized by high fever, anorexia, diarrhœa, prostration and convulsions, and ending in death in from 30 to 48 hours after the injection. 5, Sterilized cultures of the microbes (in other words, their metabolic products alone) similarly possess phlogogenic, pyrogenic and pyogenic properties, though in a somewhat mitigated degree.   6, The *bacillus pyocyaneus* seems to be endowed with a more energetical pathogenic action than the *bacillus pyofluorescent.*   7, In man the pathogenic effects are comparatively less marked than in lower animals.   Still, either of the bacteria undoubtedly can make and intensify suppuration, and produce fever.   8, On the whole, the prevailing view according to which blue suppuration should be regarded as a trivial or harmless complication of the wound, is decidedly wrong.   On the contrary, the "cyanomycosis" forms a serious, infectious complication, since the morbid process distinctly retards healing of the lesion and is character· ized by a refractory and tedious course and contagiousness (being easily transmitted from wound to wound, from man to man).   9, Hence, as soon as the complication arises, the wound should be subjected to a systematic and energetic disinfection.   The best treatment consists in washing out with a 1 to 1000 solution of corrosive sublimate, or a 4% or 5% solution of chloride of zinc, or a 5% one of carbolic acid. The affection being contagious, the surgeon should adopt such precautions as disinfecting his hands after handling a cyanomycotic wound, using special instruments for the latter, and so on.—*Khirurgitchesky Vestnik,* October and November, 1890, pp. 583-628.

VALERIUS IDELSON (Berne).

THE SUPPOSED CURATIVE EFFECT OF OPERATIONS *PER SE.*

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[CONCLUDED].

CLASS III.—Under the last heading of "Miscellaneous Operations," may be grouped several of very diverse character.

Fehling[32] reports the case of a woman who had been in bed for one year for osteo malacia. Six weeks after a Cæsarean section she was out walking, and later was entirely cured.

Hoffa[33] reports eight cases of osteo-malacia, cured by oophorectomy.

Schaua[34] reports two cases of osteo-malacia cured by:

I. Oophorectomy. Woman, æt. 32; 4 para. Typical symptoms and deformities of osteo malacia. Treatment negative in results. Confined to bed by disease 15 months.

Oophorectomy. No very marked pathological changes in ovaries. In three weeks patient left her bed; six months after operation, entirely well.

II. Porro operation (ovaries not removed); in two and a half months patient well. Osteo-malacia of five years' standing.

Baumann[35].—Of 12 Cæsarean sections, favorable influence on osteo-malacia in only three cases. Of 24 Porro operations, 20 complete cures, 4 decided improvements in condition.

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[32]Verh. d. deutsch. Gesell. f. gynakol. 1888.

[33]Beitrage zur Geburtshulfe in Gynakol. Stuttgart, 1889.

[34]Wien. Med. Woch., No. 19, 1890, p. 788.

[35]Ueber d. Einfluss der Porro Op. u. Kastrat. auf das Wesen des Osteo-malacia, Basel, 1889.

OPERATIONS FOR VARIOUS CEREBRAL SYMPTOMS, CHIEFLY EPILEPSY, IN WHICH LITTLE OR NOTHING WAS FOUND TO ACCOUNT FOR THE SYMPTOMS, BUT EITHER MARKED BENEFIT OR CURE FOLLOWED.

[TABLES CONTINUED.]

TABLE III.—CASTRATION.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result — Time between Operation and Report.	Remarks.
Jas. I Rooker.—Cincinnati Lancet and Obs., 1861, iv, 274.	35 M.	Epileptic fits of some years' duration; supposed to be caused by masturbation.	Castration double.		Cure. 3 mos.	No fit since operation.
S. S. McKinley, M.D., Irwinton, Ga. Personal interview with Mr. McGavoc, now of Br. Navy.—Am. Med. Gaz., vol. vi, 1855, p. 295.	27 "	Epilepsy from æt. 12-24 years. Had mumps, took cold and metastasis to testicles resulted.	Castration for metastasis during attack of mumps.		Cure. 3 years.	No fit since operation.
"	16 "	Boy subject to fits; fell through bridge and had one testicle mashed.	One testis removed for injury.		Cure. 6-7 years.	No fit since
E. E. McKinley.—Am. Med. Gaz., vol vi, 1855, p. 295.	14 Negro "	Epileptic.	Castrated.		Cure. 6 years.	Sold for $1,100, æt. 20. No fit since operation.
"	42 "	Epileptic from the age of 13 years.	"		Cure. 2 years or more.	No fits after operation.
Dr. McKinley.—Am. Med. Gaz., vol. vi, 1855, p. 295.		Two cases of Dr. White, of Tennessee. Two cases of Dr. Talbot, of Missouri. One case of Dr. Hacker, (deceased) of Louisiana.			Cures.	By same operation. By same operation. By same operation.

TABLE IV.—TRACHEOTOMY.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result.—Time between Operation and Report.	Remarks.
A. Wynn Williams, M.D., M.R.C.S.E.—Medical Times and Gazette, London. 1860, ii, 253.	18 M.	Fits since 10 years of age.	Tracheotomy.		Improved. 4-5 mos.	After six months fits became as frequent as before.
"	25 "	Nocturnal fits for many years.	"		Much improved. 2 years.	Very few and mild fits; resumed work.
J. C. Bucknill, M.D., London. — London Lancet, 1853, ii, 137.	22 F.	Frequent and severe fits for one year.	Tracheotomy May 2d, last.		Improved. 4 mos.	Fits reduced 50 per cent in frequency and 75 per cent in severity, and mental condition much improved.
" "	35 "	Fits for several years.	Tracheotomy June 20.		" 3 mos.	Fits lessened in severity.
Chas. Edwards.—Lancet. London. 1853. i, 492.	Adult. M.	Rapid succession of epileptic fits and terrific laryngismus.	Tracheotomy.		Cured. Several weeks.	
Marshall Hall. Operation by Mr. Holmes Ogle's case. Lancet. London. 1856. ii, 136.	17 "	Epilepsy for six years from fright; more and more frequent with blackness of face; bitten tongue and thu bs; convulsions; stupor; mania; idiocy.	"		" 2 mos.	For two days after operation had slighter fits, none since. Restored from idiocy and strength improved.
Marshall Hall Operation by John Neill, E.q., Penn. Hosp. Philadelphia.—Lancet. London. 1853. ii, 233.	29 "	First fit nine years ago; cause unknown. For past year could not attend to business. Fit every other day; at times 15 to 20 in one day. Mind affected.	"		Much improved. Nearly 2 mos.	Nothing like a fit until 13th day when he attributed to removal of tube. Died May 2d in a fit, having had only slight symptoms of an attack on two or three occasions. Dr. Neill thinks the tube had fallen out and death occurred before it could be replaced.

TABLE IV.—CONTINUED.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result.—Time between Operation and Report.	Remarks.
W. H. Cane, Esq.—Lancet. London. 1851, ii, p. 35.	34 M.	Fits seven or eight years; recently thrice weekly.	Tracheotomy.		Cured. 4 mos.	No fits since.
Marshall Hall, Mr. Anderson's case.—Lancet. London. 1851, ii, p. 563	36 F.	Fearfully epileptic for twenty-four years.	"		Much improved. 3 mos.	

TABLE V.—REMOVAL OF SUPERIOR CERVICAL GANGLIA OF SYMPATHETIC NERVE.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result.—Time between Operation and Report.	Remarks.
Wm. Alexander.—"The Treatment of Epilepsy." Edin. and London. 1889.	13	Has had fits since 9 or 10 years of age and increasing.	Removal of superior cervical ganglia.		Cured.	No fits for eighteen months.
"	16	Has had fits for five or six years. They are numerous and increasing.	"		"	No fits for about two years.
"	19 F.	Hereditary epilepsy. Has been dull and stupid for fifteen years.	"		"	No fits for one and one-half to two years. Is now married and mind is clear.
"	18	Has had fits for four years.	"		"	Probably had no fits for two years, and is now working.
"	14	Father and two sisters epileptic. Had first fit when 18 months old.	"		"	No fits for two years.

		Removal of superior cervical ganglia.	Cured.	No fits for two to three years.
Wm. Alexander —14 "The Treatment of Epilepsy." Edin. and London. 1889.	Has had fits for eight or nine years; very bad case; is dull and stupid.			
" 18	Has had fits for five years.	"	Improved	Patient disappeared from observation.
" 36	Has had fits for sixteen years, and are increasing in number.	"	"	(Only one ganglion fully removed).
" 33	Has had fits for eighteen years, and they are increasing in number. Mind is also failing.	"	"	Fits reduced to one-half their former number, and the mind is better.
" 39	Has had fits since infancy.	"	"	Got worse after going home which was due to bad surroundings.
" 23	M. Has had fits for six years.	"	"	
" 16	Has had fits for one year,	"	"	Improved mentally and physically and fits are lighter.
"	F. Has had fits since birth; a very bad case.	"	"	Much improved at last report.
"	Has had fits since 13 years of age.	"	"	Much improved during last three months.
"	Has had fits since 13 years of age.	"	"	Was improving very much, but died of pneumonia.
" 13	Had had fits for three years. Mind was stupid.	"	"	Improved very much.

This table is taken from a list of 24 cases, of which 6 recovered and remained well at the end of 2 years; 10 were improved; 5 remained unimproved; and none of these have been made perceptibly worse by the operation; 2 died soon after operation, but not from its direct effects; and one has never been heard from.

TABLE VI.—INCISION IN SCALP, INCLUDING ALL THE SOFT TISSUES.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result. — Time between Operation and Report.		Remarks.
T. F. Palmer.—London Med. Gazette, 1835-6, xvii, 221.	F. 35	Pain over right temple for some months, followed later by fits.	Divided integuments down to bone Mar. 5. Later removed circular portion of scalp; seton in neck. *Lastly trephining.*	Cranium more than twice as thick as natural. Dura adherent and healthy.	Cured	1 mo.	First incision reduced fits for few weeks; removing piece of scalp caused them again to cease for a time. A seton in the neck gave her immunity. After trephining, two fits few hours after operation; none since; has not felt so well for two years.
Graham Fitch.—Am. Pract. Louisville. 1877, xvi, 212.	21	Fell at the age of 7 years, striking head; unconsciousness for a time. Depression in parietal bone felt.	Incision in scalp over depression, 1 inch in length, kept open 3 months.		"	1 year.	But one fit since operation, and that was soon after operation.
Schmucker.Schmucker's Vermischte Chirurgische Schriften, 1-76, p. 252.	M. 22	Scar at upper inner portion of left orbit. Fits two months. (First fit probably few weeks after blow). One or two attacks daily.	Skin incision made one day; next day left hemiplegia involving tongue. *Trephined.*	Dura normal, but separated slightly from the bone.	"	3 mos.	Fits did not recur. Hemiplegia relieved. Patient completely cured.
F. H. Hamilton.—Buffalo Medical and Surgical Jour. and Rev., v, p. 460.	" 23	Peculiar epileptic fits since 5 years of age. Fell out of bed at the age of 3 years, and struck head.	Dissected up scars on scalp.	Skull found normal so trephining was not done; flaps replaced.	"	3 mos.	Writes at this date and considers himself cured. Mind clear, etc.
Dr. Parish.—Philadelphia Med. Exam., 1843. p. 14.	" 20	Struck head against gas pipe; few fits for first few days; return after eight months.	Incision through tender spot of scalp and few tissue peas introduced and retained by plaster.		"	2 to 3 yrs.	No return of fits.
Mr. Bryant.—Lancet. London. 1879, ii, p. 799.	Adult. "	Localized pain in head and epileptic attacks following injury five years previously. Appeared to be depression of skull.	Incision of scalp.	As skull was normal and no fracture or depression, trephining was not done.	"	2 yrs.	Pain and convulsions left patient from moment of incision.

Mr. Bryant, (Lancet. London. 1879, ii, p. 799), reports two other cases, almost similar, followed by perfect relief.

TABLE VII.—MISCELLANEOUS OPERATIONS.

Operator and Reference.	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result.—Time between Operation and Report.	Remarks.
Dr. Hadden. Before Clinical Society, London.—Lancet, London. 1887, i. p. 472.	32 M	Shot in left calf in 1872; several shot extracted. Four months after began to have fits. For nine months occasional, afterward as many as 12 daily.	Sciatic nerve stretched.		No fits afterward for thirteen years, and then began again. Thirteen years and 4 months.	Fits began with sharp, twitching pain in scar in calf. Scar tender and pressure sometimes caused convulsion. Nerve stretched and time; 10 fits for nine days; then occasional seizures while in hospital. Four months later man wrote and said he had no fit since he left the hospital.
Mr. Bowlby. Before Clinical Society, London.—Lancet, London. 1887, i. p. 472.	"	Shot in leg eighteen months before; fits increasing in frequency and force, preceded by pain in region of leg supplied by musculo-cutaneous nerve.	One and one-half inch of musculo-cutaneous nerve excised.		Five years without fits. Five years.	Fits recurred; some shot found under skin and removed. Temporary stoppage of fits. Mr. Willett later stretched sciatic nerve. Fits gradually ceased and no further recurrence.
Horace Green, M.D.—N. Y. Med. Gaz., 1853, iv, 98.	" 37	Epilepsy twenty-seven years. Under use of silver nitrate for two years, fits ceased, and he had acquired argyria. Fits recurred and had several daily.	Cauterization of larynx. Probang with silver nitrate 35 grs to f. oz. j. thrust in larynx Later 80 grs.		Fits ceased while under treatment.	Struck with insensibility of larynx. After using silver fits would be checked for a period of 10 days or upward. On recurring the same treatment would again arrest them.
B. Fordyce Barker.—N. Y. Med. Gaz., 1853, iv, p. 248.	F 26	Epileptic fits at or about menstrual period. Usual medication without benefit.	Cauterization of larynx. Silver, 60 grs. to f. oz. j.		Fits arrested while under treatment.	If larynx was cauterized a few days before menstruation period, fits surely prevented.
P. J. Lehart.—Ohio Medical Recorder, Columbus. 1880-1, v, 102.	M. 18	Epileptoid seizures.	Circumcised.	There was no irritation about glans or foreskin—only a long prepuce.	Cured.	Doctor thinks the cure is permanent.

TABLE VII.—Continued.

Operator and Reference	Age and Sex.	Supposed Cause, Duration and Character of Fits.	Operation.	Conditions Found.	Result.—Time between Operation and Report.	Remarks.
Thos. J. Griffiths.—Rep. Superv. Surg. Mar. Hosp. 1876, p. 203.	24 " 29 26 29	Epilepsy. " " "	Seton back of neck. " " " " " " " "		Improved, 6 wks. Recovered. 6 mos. Improved 2 mos. Recovered. 5 mos.	
S. D. Risley.—Personal communication.	Boy.	Shambling gait; low grade of intellect, and curious group of symptoms, diagnosed as epilepsy.	Tenotomy of external recti.		Improved.	The frequently recurring spells twice arrested by the operation for six weeks, and shambling gait and mental habits were much improved. Relapsed however, each time.
M. Ch. Fére.—Soc. med. des Hop. de Par., 1888, T. v, 3 s. p. 132.	32 "	Convulsions.	Scalp burned by 6 to 15 fire-points.		Cured.	Fits decreased and at time of writing had no fits for five months.
M. Gambarini, Paris. London Lancet, '39.		Convulsions.	Acupuncture needle passed four times into heart to the depth of 3 inches.	Attacks always preceded by symptoms of angina pectoris.	"	

TABLE VIII.—SPONTANEOUS AND ACCIDENTAL CURES OF EPILEPSY.

Reference.	Age.	Sex.	Supposed Cause, Character and Duration of Fits.	Alleged Curative Agent.	Remarks.
Jno. C. Pearson, M.D., Ursa, Ill.—Med. and Surg. Reporter. Philadelphia. 1867, xx, p. 145.	40	M.	Fits since early boyhood. Every few days to two or three months.	Fell in a fit on bed of live coals in fire place. Dreadfully burned on hands, arms, face, neck, breast and head. Treatment: opium and stimulents and carron oil.	No fit up to this time—four years. Before burn, being drunk would bring on fit, but since, it does not.
M. Reece, M.D., Abington, Ill.—Ibid, p 259	12	"	Duration, fifteen months; fit daily. Always lost consciousness.	Fell against stove in fit; right side of face burned from outer cadthus of eye over temple and malar bone. Third degree (Dupuytren).	No fit after burn until reported—two months.
Wm. Henderson, M.D., Corstorphine.—Edinburg Med. and Surg. Journal, 1836, xlvi, p 96.	8	"	Epileptic fits for over one year. Aura mild but frequent. Took whooping cough and each spell of severe whooping caused fit. Confined to bed. Fits affected temper and mind.	During severe spell of coughing had profuse epistaxis.	From moment of epistaxis never had another fit, and rapidly regained health and sanity. Continued well one year later.
Wm. Heise, M.D.—Dublin Med. Press, 1843; x, p. 146. Communicated to J. O'Beirne. M.D., Pres. Royal Col. Surgeons.	36	"	Confined for two years as a dangerous lunatic; frequent and regular epileptic fits; no history; fits generally every third day.	Attacked by another lunatic and sustained fracture right parietal bone, with depression and several large spicule driven through dura in o brain; considerable cerebral substance forced out through wound; copious haemorrhage, e c.; usual treatment.	Now paralytic, paraplegic, but sensation remained. Incontinence of urine and faeces. Intellect more rational and acute; fits less frequent and finally ceased. Continued so for over six years, when he died.
Jacob Sproul.—Medical Times. London 1884, ix, p. 152.	21	F.	Two fits of epilepsy daily.	Severe burn back of hand and arm and side of face and neck. Capsular ligament on back of fingers destroyed, etc.; amputation advised. She refused and treated with splint and ung. lapis calm. Cure.	No fits since burn three years ago
R. Beveridge, M.B., Lect. on Path., and Path. to Royal Infirmary, Aberdeen. Med. Times and Gazette, London. 1889, i, p. 390.	70	"	Epileptic fits for ten years, generally once a fortnight; usual characters; complete unconsciousness. Fell over a precipice, cause of fits.	Fell in fit in fire and severely burned; whole scalp charred, also eyes, lips, cheeks and ears, also tip of tongue; patient much shocked. Seventeen days later consciousness returned; five days later both eyes fell out Exfoliation of frontal, nasal and part of ethmoid bones.	All healed over in eight months. Death fifteen months after burn from influenza. No fit after burn and enjoyed good health.

TABLE VIII.—CONTINUED.

Reference.	Age.	Sex.	Supposed Cause, Character and Duration of Fits.	Alleged Curative Agent.	Remarks.
Salvator de Renzi.—Jour. d. pract. Heilk. Berlin. 1838, lxxxvi, 1st, 106.	18	M.	Since eight years had epilepsy; attacks at least once a week; resisted every known therapeutic agent.	Gun-powder explosion and fall from upper story of house. Complicated fracture frontal and left upper jaw bones. Patient 5 months in bed. Suppuration and exfoliation of bone. No epileptic attack during this time. Loss of epileptic facies. Increased mental powers.	On closure of head wound attacks renewed with increased violence. On placing a setou in neck, epilepsy again nearly disappeared.
W. E. Wormes.—Mag. f. d. ges. Heilk. Berlin 1841, lviii, 84.	48	"	Since early youth, daily attacks of epileptic convulsions. No treatment was of any value.	Severe burn of face during a fit; profuse suppuration and six weeks to cicatrize. Free from fits during this time. As ulcer-surface closed had headache; following fright had fit of unusual severity and thereafter his disease was same as before.	Fits ceased while wound was open, but recurred as before after it had cicatrized over.
Dr. H E. Groen, Ky.—W. J. M. and Phys. Science, 1850, iii, 209.	48	" Negro	Fits two and a half years. Had been treated with all sorts of drugs without benefit.	During fit fell in fire and had foot severely burned. Took four months to heal.	No fits while wound was healing (four months) but recurred after wound had healed.
Case of Dunat, cited by Delasiauve. Traité d' Epilepsie, p. 422. Paris. 1854.		M.	Young man subject to fits.	Assailed by robbers, wound in forehead, destroying large portion of bone; wound open a long time, but finally cicatrized.	Cured. No fits after injury.
W. H. Edwards.—Virginia Med. and Surg. Journal. Richmond 1855, iv, 204.	24	F. Negro	First fit at 12 years of age, after full meal; continued ever since. In a fit fell on hearth and sustained severe burn of foot; very deep; sore kept open and offensive.	Amputation below knee on account of burn received 5 years before.	Fits continued during five years; the burn was suppurating, but ceased at once after amputation and had no recurrence. Three years.
Aubanel.—Gaz. méd. de Par. 1839, 2 s., vii, 679.	40	M.	No heredity; eighteen months after severe fright; had a fit. Fits continued. During attack left arm and knee severely burned.	Amputation of arm high up for burn. Wound healed in one month.	Cured. No fit since amputation, now eighteen months.
Aubanel.—Gaz. méd. de Par. 1839, 2 s., vii, 679.	50	F.	No heredity. Fits began at 15 years, and increased to 15-20 a day at times. At 25 years received a severe burn of right hand.	Amputation of hand for burn.	Cured. No fits since amputation, four years.

Passing to quite another subject the following communication from a careful and experienced observer is of great interest:

Neglecting the large group of patients who have been relieved by tenotomy of the ocular muscles from symptoms altogether out of proportion to the very slight defect which it was sought to correct, I call to mind but one case which seems to fall within the scope of your inquiry.

A young woman, æt. 20, sought advice for an exophthalmos on right side. There was a marked aneurismal thrill and bruit. Pressure was made over the carotid with the result of temporarily arresting the thrill and bruit. This was repeated three times, and an appointment made for consultation a week later with Dr. Agnew. The exophthalmos remained, but the thrill and bruit, so unmistakably present before, were absent Dr. Agnew suggested an exploratory puncture, which I made, the findings to be described being verified by him. A resisting mass, apparently the size of a filbert, was lying deep in the upper and inner angle of the orbit. The vision was still $^4/_5$, and no operative interference was advised. She returned to her home in the interior of the State. Six months later her father reported that the exophthalmos had disappeared under the administration of "herbs", directed by an old woman in the mountains.

Philadelphia, Pa., March 23, 1891.   Samuel D. Risley.

It seems to me that in other ophthalmological work still further illustrations of my subject may be obtained, though I express my opinion in this direction with some diffidence:

In the belief that the constant effort to maintain single vision in cases of insufficiencies of the external ocular muscles leads reflexly to irritation inducing nervous troubles in distant parts, Dr. George T. Stevens has elaborated an operative technique intended to restore the faulty equilibrium of those muscles, known under the name of "graduated tenotomy"—a name sufficiently descriptive of the method.

Freely admitting the universally accepted doctrine that refractive errors and imperfect equipoise of the external ocular muscles are important factors in the production of numerous cases of headache and so called "reflex" nervous manifestions, and also freely acknowledging the value of tenotomies, both complete and graduated, in the restoration of equilibrium to

badly balanced ocular muscles, I am none the less convinced
that in numbers of instances of reported cures of chronic
chorea, petit mal, and even delusional insanity the effect of
the operation *per se* in large measure was the potent cause of
the supposed cure. This is founded not alone upon theory,
but rests upon the fact that in certain cases of "reflex nervous
troubles" a cessation of the symptoms has followed the tenot-
omy, although this has not produced perfect equilibrium; or in
other words, the effect of the supposed cause ceases, although
the supposed cause itself continues to obtain, the only impres-
sion made having been by an incision, not again repeated, and
not complete enough to accomplish the object for which it
was undertaken. Again the relapses which may take place
after a perfectly successful series of tenotomies would indicate
that the nervous phenomena attributed to the "insufficiencies,"
for the relief of which the operations were made, were not
correctly so attributed, and that the temporary relief must be
ascribed to some cause other than the restoration of an imper-
fect balance of external ocular muscles.

Disturbances of the nervous system from supposed reflex
action scarcely come within the scope of this paper or I should
have been tempted to include some of the extraordinary
cures which have been reported as following circumcision.
Whether the partial paralyses, defective co-ordinations, con-
vulsions, deformities, etc., were or were not really due to spinal
anæmia of reflex origin, there can be no question that in the
number of well-authenticated cases their disappearance fol-
lowed the removal of a narrow and adherent prepuce.[36] Is it
possible that a certain proportion of them would have been
equally benefited by the amputation of a toe or finger? The
question may be worth considering, even if the answer seems
to be obviously in the negative.

Neither have I intended to include in this paper any ex-
tended consideration of those cases in which the disease is
purely imaginary, although the field that would be opened up
in this direction is very fruitful, especially in reference to the
operations of charlatans and to those of the extremists and one·

[36]Trans. Ninth Intern. Med. Cong., p. 461, vol. iii.

ideaed specialists always to be found in the ranks of the profession.

The *post hoc ergo propter hoc* method of argument is the refuge of all such operators and various surgical procedures have from time immemorial in this manner been credited with remarkable cures.

An example may be found in the history of what Dr. Van Buren[37] has called ' phantom stricture" of the rectum, a malady which in the first half of this century was almost epidemic in Great Britain. So prevalent was the delusion as to the great frequency of rectal stricture, its origin in spasms and its curability by bougies. Dr. Van Buren[38] quotes from Moliere an illustrative story of a lady in London, who, recommended to a specialist for costiveness, was examined with a bougie and pronounced strictured   Her husband, surprised and angry at the liberty taken with his wife, rushed off with a horse-whip to the house of the offender, but came home again after a little to his anxious partner confessing that he had grieviously wronged a most worthy gentleman. The specialist had not only satisfied him as to the certainty of the lady's malady, but had proved, by inserting a bougie, that he also had a stricture. Horace Walpole furnished similar evidence in one of his letters. He warns a friend, who is about going to Bath for his health, not to fall into the hands of a notorious practitioner of that place who always found his patients affected with contraction of the lower bowel and set them to introducing bougies. His friend, in response, warns Walpole not to joke about serious matters, for he had already consulted Mr ——, who had actually found an obstruction in his bowel that caused all his symptoms, and that he was already getting better under Mr. —— 's skilful use of an instrument which he was inserting daily.

The practitioner alluded to was probably Mr White who published various articles on this subject from 1809 to 1822, having succeeded in finding strictures of the rectum beyond the reach of the finger and recognizable only by the bougie in the vast majority of cases that he examined. In reply to just criticisms he asked "why so many persons have been completely relieved from the most distressing symptoms by the use of the bougies when all other means had failed, if no real obstruction had existed in the intestine" a query which Dr. Van Buren characterized as an *argumentum a posteriori*.

[37] Amer. Jour. Med. Sc., vol. lxxviii, p. 317.

[38] Traites des Maladies du Rectum, Paris, 1877, p. 320.

This same idea applies to many similar delusions of the present day, among which may be mentioned the extraordinary number of strictures of the pendulous urethra, together with an equally extraordinary variety of symptoms supposed to be produced by them, all of which are "cured" by certain operative procedures not without danger and fully capable of producing and acting through a powerful mental impression. I am inclined to include in the same category also various cases of nephrorrhaphy for so-called floating kidney in which the symptoms before operation were somewhat vague and indefinite, as well as a large number of cases of castration for nervous disease already alluded to. The reported cures of traumatic tetanus by nerve stretching may also be mentioned in this list.

B. In seeking for a reasonable explanation of the phenomena observed in the above cases I have endeavored to formulate the conditions which were common to all, or nearly all of them, and have thought the following worthy of consideration:

1. Anæsthesia.
2. Psychical influence or so-called mental impression.
3. Relief of tension.
4. Reflex action or the "reaction of traumatism."

These influences were operative in the majority of the cases although not one of them, except the last, applies to the whole list.

1. *Anæsthesia.*—In my original very vague speculations (which, I may admit, have not become much more definite), as to the possible cause of the improvement in epileptics after such a variety of operations of such different grades of severity, it occurred to me that one constant factor was the production of anæsthesia and that it was conceivable that a disease of the nerve centers not reached by ordinary drugs might be affected by agents of such volatility and diffusibility as ether and chloroform. I accordingly, with the consent of my neurological colleagues, instituted a series of observations upon a number of epileptics in various stages of the disease at one of the hospitals with which I was connected. All other treatment having been withdrawn and the cases kept under observation for a time,

ether was given to the production of full anæsthesia at inter-
vals of from forty-eight to seventy-two hours. The results
were either entirely negative or the patients grew worse in con-
sequence of the withdrawal of their bromides and after a
trial extending over some weeks and in a considerable num-
ber of cases I satisfied myself that anæsthetization alone pro-
duced little or no effect in either the severity or the frequency
of epileptic convulsions. In the majority of these patients the
disease was, of course, of the idiopathic variety, but it must be
remembered that in cases of supposed traumatic epilepsy in
which nothing abnormal is found on operation the diagnosis
has probably been incorrect, and the type of the disease is
really idiopathic. The error is facilitated by the frequency
with which scars and other relics of former traumatisms are
found on the scalps of epileptics, injured during their convul-
sive attacks.

As applied to abdominal and other cases any marked influ-
ence of anæsthesia alone scarcely seems within the limits of
possibility and need not be considered.

2. *Psychical influence.*—In discussing the effect of psy-
chical influence it is necessary at the outset to admit that
so far as the symptoms in any case are susceptible of
explanation on the theory of hysteria or of imagination,
their disappearance after a powerful mental impression
is easily understood. But only a small proportion of my
cases were of this character if the reporters may be believed.
The epileptics were genuine epileptics and their paroxysms
were attended with all the characteristic phenomena, including
the personal injury and risk to life which seem to differentiate
them from hysterical or feigned convulsions. The tumors
were palpable or visible or both; the character of the tubercu-
lar growths was verified by the sight and touch of skilled ob-
servers. It may accordingly be assumed once for all that as re-
gards at least two-thirds of the cases on which this paper
is based, there were either undoubted symptoms which we
habitually associate with organic disease or there was demon-
strable and apparently unmistakable evidence of such disease.
It must therefore be asked: Is it possible through influences
acting upon the emotional or intellectual nature to affect the

organic processes of secretion, nutrition, etc., and, if so, is it conceivable that through the same influences pathological change may be arrested and reparative or curative action established?

An exhaustive reply to this question would lead us far afield, but I must briefly review the evidence which appears to justify a general affirmative answer.

History is full of authentic examples of the influence of the imagination and the mind upon the body.[39] The "miracles" of Mecca, of Rome, of Lourdes; the effects of the "royal touch"; the wonders wrought by Perkins and his "tractors"; the equally marvelous cures brought about by imitation tractors in the hands of his opponents; the modification and alleviation of actual epidemic disease, through faith in an individual, as by Victor Emanuel's visit to Naples during the cholera epidemic of 1805;[40] the occasional striking results of "faith

[39] In all ages wonderful cures, real amid a multitude of shams, have been wrought at holy places dedicated to various saints of various cults. Among the throngs of pilgrims to Mecca, to the sacred rivers and temples of India, to the shrines of Buddhist hagiology, there are some who, having made the outward journey wearily and painfully, do indeed turn homeward with the gift of health. A proportion of those who have limped or been carried to Lourdes and to a hundred other holy places of the Catholic Church, do leave behind them crutches that they no longer require. Some of the sufferers who worshiped the Holy Coat at Treves did truly receive in restored health the reward of their faith. Some wearers of relics and amulets are really the better for possessing them. The cheered, uplifted and convinced mind works, sometimes with startling rapidity, on the diseased body.

For this same reason, touching the king's evil did no doubt effect many cures. The royal progresses were announced some time beforehand, and the sufferers along their route had often weeks in which to cherish the expectation of healing, in itself so beneficial; and in those days of faith, when a belief in the divine right of kings was universal and strong, the touch of the royal hand must, except in the most hopeless cases, have had a stimulating effect, which may often have caused a healthful reaction.—"Psycho-Therapeutics." By C. Lloyd Tuckey. 1889. Pp. 10 to 11.

[40] During the famous seige of Breda, in 1625, the garrison was afflicted with scurvy in a most dreadful degree. When the Prince of Orange heard of their distress, and understood that the city was in danger of being delivered up to the enemy by the soldiers, he wrote letters addressed to the men, promising speedy relief. These were accompanied with medicines against the scurvy, said to be of great price, but of still greater efficacy; many more were yet to be sent them. The effects of this deceit were truly astonishing. Three small phials of medicine were given to each physi-

cure" and "Christian science," and of homœopathy and the other "pathies" at the present day, are well-known examples of the undoubted therapeutic power of the mental or cerebral processes or conditions under certain circumstances. But in the majority of these cases pain, the most uncertain and indefinite of all symptoms and the one most influenced by the personal equation, was the phenomenon chiefly affected; or loss of power, almost equally vague when not studied scientifically and by modern methods; or perhaps the secretions merely were modified advantageously as the "fluxes" of cholera, fear producing relaxation of the vessels as seen in the sweats and diarrhœa of young soldiers on the eve of their first battle, faith and hopefulness counteracting this tendency. All this is easily explained when we remember the antagonism which exists between the two great divisions of the nervous system as regards vascularity, a fact which underlies many of the striking physical phenomena associated with varying mental states.

The normal equilibrium which we witness between the cerebro-spinal and the sympathetic systems, as respects their influence upon the blood-vessels, is obviously more or less interfered with, when the brain transmits a more than wonted impulse; allowing the unrestrained action, or paralyzing the influence of the sympathetic vaso-motor nerves.

The application of a similar principle, in regard to the functions of the cerebrum and the spinal cord, explains the unbalanced action of the latter when the former is temporarily paralyzed by mental shock, and probably goes far to elucidate

cian, not enough for the recovery of two patients. It was publicly given out that three or four drops were sufficient to impart a healing virtue to a gallon of liquor.

The effect, however, of the delusion was really astonishing, for many were quickly and perfectly recovered. Such as had not moved their limbs for a month before, were seen walking the streets sound, straight and whole. They boasted of their cure by the Prince's remedy; the motion of their joints being restored by a simple friction of oil; and the belly now of itself well performing its office, or at least with a small assistance from medicine. Many who declared they had been rendered worse by all former remedies administered recovered in a few days, to their inexpressible joy, and the no less general surprise, by their taking (almost by their having brought to them) what we affirmed to them to be their gracious Prince's cure.— "Of the Imagination as a Cause and as a Cure of Disorders of the Body; Exemplified by Fictitious Tractors and Epidemical Convulsions. By John Hygarth, M.D. 1801. Pp. 29, 30.

the remarkable influence of the emotions in causing convulsive disorders.[41]

But before we can assign to this cause any important share in the production of the benefit following operation in such cases as we are considering we must examine the existing evidence as to its possible influence upon morbid as well as upon physiological processes.

A belief in this power has been common in the profession for many years. John Hunter said "as the state of the mind is capable of producing a disease another state of it may effect a cure." Benjamin Rush wrote that he had frequently prescribed remedies of doubtful efficacy in the critical stage of acute diseases, but never till he worked up his patients into a confidence bordering upon certainty of their probable good effects. He adds that the success of this measure much oftener answered than disappointed his expectations. Tuckey thinks[42] that continuous fixation of the mind upon one special organ predisposes to disease of that organ and cites illustrative cases, as the death of Trousseau from cancer of the stomach.

Forbes Winslow[43] goes so far as to say that "it is a well established fact that alterations of tissue have been the result of a morbid concentration of the attention to particular organic structures."

As an example of the extraordinary effects of purely psychical impressions I may mention the case narrated by MacKenzie,[44] in which a patient who was subject to attacks of rose cold, was shown an artificial rose at a time when her nostrils had just been examined, her conjunctivæ were normal, the nasal passages free and there was nothing to indicate the presence of her trouble. Dr. MacKenzie describes as follows the result of showing her the rose, which was a clever counterfeit: "In the course of a minute she said she felt that she must sneeze. This sensation was followed almost immediately by a tickling and intense itching in the back of the throat and at the end of the nose. The nasal passages, at the same time, became suddenly ob-

[41]Influence of the Mind upon the Body. By D. H. Tuke. Vol. ii, p. 288.

[42]Psycho-Therapeutics, 1889, p. 4.

[43]Obscure Diseases of the Brain and Mind, London, 1860.

[44]Amer. Jour. Med. Sc., vol. lxli, p. 49.

structed, and the voice assumed a hoarse, nasal tone. In less than two minutes the puncta lachrymalia began to itch violently, the right and afterward the left conjunctiva became intensely hyperæmic and photophobia and increased lachrymation supervened. To these symp-toms were added, almost immediately, itching in the auditory meatuses and the secretion of a thin fluid in the previously dry nasal passages. In a few minutes the feeling of oppression in the chest began, with slight embarrassment of respiration. In other words, in the space of five minutes she was suffering from a severe coryza, the counterpart of that which the presence of natural roses invariably produced in her case. An examination of the throat and nasal passages was then made. The right nostril was completely obstructed by the swollen, reddened, irritable turbinated structure; the left was only slightly per-vious to the air-current; both were filled with a serous-looking fluid. The mucous membrane of the throat was also injected, but did not exhibit the same amount of redness and irritability found in the nasal passages."

Leloir[45] has called attention to what he calls "dermatoses par choc moral." He reports cases of cutaneous anæmia, ("local syncope"); of cutaneous hyperæmia, such as erythema and urticaria; of hæmorrhage, such as purpura; of inflammations, superficial and catarrhal; of herpes; of pemphigus, and even of psoriasis; produced by various forms of nervous shock. He has been most careful to establish the proper re-lation of cause and effect excluding all cases in which skin diseases had previously existed or in which there had been any chronic predis-posing condition of any sort. He believes that in patients not sus-ceptible the shock would produce simple vaso motor phenomena more or less transitory, while in the susceptible subject the effects are both more intense and more permanent. He quotes Charcot, Vulpian, Brown-Sequard and Westphal, to show that grave nervous affections even resulting in death may follow shock, and refers to the well known effect of fear upon the intestinal and urinary tracts as corroborative evidence. Similar cases are reported in extenso by one of his pupils, M. Lévèque.[46]

Bouchard[47] has shown the influence of similar nervous shocks in the production of attacks of gout.

[45] Ann. Derm. and Syph., second series, vol. viii, 1887.

[46] Contribution à l'étude des Maladies de la Peau produites par un Choc Moral, Thèse de Lille, 1887.

[47] Lecons sur les Auto-Intoxications, Paris, 1887.

Further evidence of the same sort has been recorded by M. Le Brun.*[48]

Dr. R. W. Taylor sends me the following interesting case:

A lady, æt. 36, of fine physique, never before sick, married, mother of one child, was suddenly informed of the death of her husband. She fainted away and when restored she noticed a burning sensation of the whole face and neck (no local applications had been made while she was in the faint). Within a few days erythematous eczema set in and ran a very severe course, leaving her with a tendency to scaling eczema of the ears ever since. This case was completely analyzed by me, and set down in my records as one of eczema from mental shock. I have seen a few more, but not any which presented such a clear history as this one.

New York, March 27, 1891.

Dr. James Nevins Hyde writes me in reference to this phase of the subject:

I remember distinctly that Dr. Detmold used to produce astonishing effects (for the time being at least) in the cure of stammering by thrusting a heated needle into the tongue, and he used to produce roars of laughter in his class by his comical descriptions of cases of this kind.

You are of course familiar with the remarkable cures produced by "taking the eye out and scraping it and putting it back" into the orbit, the actual operation having been perhaps so simple an affair as the eversion of one of the lids, or perhaps a still simpler manipulation of this part.

I reported not many years ago the details of a case in which a gentleman in moderate circumstances was suddenly informed that he had inherited a large property. For several hours after learning of this fact he was in a state of intense cerebral excitement, and his hair, which had previously been of a light brown shade, became red; and

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*The *curative* effects of shock are illustrated by the following case: "Eve's Surgical Cases," p. 725, from *Brewster's Philosophical Journal.* A man so much palsied in his limbs that for three years he had not been able to walk over one-half mile, took passage on a sailing ship to New York. During the first days of the voyage he was never seen to stand up. The vessel was struck by lightning; the rod of the conductor (four feet long and five and one-half inches in diameter) was melted. After this the man was seen parading the deck, and his power was completely restored.

[48] Thèse de Doctorat, Lille, 1886.

the distinctive line between the previous color and that to which it had changed was not only distinctly recognized at the time of my examination but also seen plainly in the hairs which I exhibited to the American Dermatological Association. Other cases have been reported of remarkable and sudden changes in the hair-color due to nervous excitement of various sorts, one such reported from Washington, where the hair suddenly turned black in the case of a young woman suffering previously from other ailments.[49]

All these cases are subject to the possible explanation that under the influence of the nervous excitement there occurs an exceedingly profuse diaphoresis, and the excessive sweat in a debilitated subject will sometimes wash the pigment to the surface and produce not only in the hairs but upon the surface of the skin very singular changes.

I am sure you have seen some thin and nervous women, say between the ages of 20 and 35, for the most part unmarried, who, when greatly fatigued or when the nervous system had been agitated from other causes, have exhibited singular black streaks about the lips and temples, which were by their friends supposed to be the accumulation of soot upon the surface, but were really due to the deposit of pigment in this locality, such pigment being often sufficient in quantity to soil a linen handkerchief wiped over the surface.

Chicago, Ill., March 19, 1891.

It has been demonstrated and is not now disputed that nerves may act directly upon cells, pigmentary, secretory, and other tissues without the intervention of blood-vessels.

Lister's observations on the pigmentary cells in the web of a frog's foot have proved that change of color is there "dependent upon molecular movements carried on in the interior of cells under influence of the nervous, and under circumstances which exclude the intervention of the blood vascular system"; and, as Prof. Rolleston observes, "A force which can be seen to produce molecular movement within a pigment cell, may well be supposed to be competent to produce nutritional or

[49]Dr. D. W. Prentiss has recorded two cases of remarkable change in the color of the hair during treatment with pilocarpin, one of them occurring in a young woman, æt. 25, the other in a baby, æt. 14 months. In the first case the hair between November, 1879, and May, 1881, changed from a light blonde with a yellow tinge to a pure black. In the second case the change was less marked, and was rather a difference of shades than of color. *Phila. Med. Times*, July 2, 1881, and August 13, 1881.

chemical changes in the interior of cells of other characters."[51]

It seems fair to assume, therefore, that psychical influence abstractly considered possesses the potency to effect many of the causes we are considering. That it has done so I do not pretend to assert. It would leave unaccounted for the curative effect of these operations in imbeciles; as well as my failures to affect epilepsy by anæsthetization when the mental effect was the same as if an operation had been performed. Still we must unquestionably admit that it is a therapeutic force, at present quite beyond our control, but possibly capable of future scientific employment.

Forty years ago Mr. James Baird[52] undertook a laborious course of experiments on patients in waking conditions, as well as on others when in the hypnotic state, by which he thought he had demonstrated, not only that an act of fixed attention, on the part of a patient, directed to any organ or part of his body, was adequate to change the normal condition of the organ or part, both as regarded sensation and function, even during the waking condition; but that he also had proved that, through audible suggestions, the function of any organ or part might be excited or depressed with great uniformity, or varied according to the suggestions of a second party, conveyed in an energetic and engrossing manner. Especially was this the case if the patient or subject possessed a vivid imagination, and lively faith in the fulfillment of the prediction. Mere fixity of attention clearly brought out an exalted manifestation of the naturally predominant susceptibility of the organ or function upon which attention was fixed; but fixity of attention, together with an expectant idea as to the peculiar result to be anticipated, was generally followed by a result corresponding precisely with the dominant expectant idea in the mind of the patient during his fixed act of attention.

Hypnotism, however, fell into undeserved disrepute and it is only of recent years that an attempt has again been made to give this form of

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[51]Tuke, Op. Cit., vol. i, p. 145.

[52]Hypnotic Therapeutics, Monthly Journal Medical Science, vol. viii, 3d Series, p. 18, 1853.

psychical influence a place in practical therapeutics. Tuckey and others detail some most interesting experiments in this line. Prof. Delboeuf, of Liege, for example, desiring to ascertain the positive effect of hypnotic suggestion in the treatment of a burn, and being of course unable to find two persons of identical constitution and condition generally, used the ingenious device of producing, with caustic, two exactly similar burns on the same person—one on each arm—and of treating one wound by curative suggestion, combined with the usual remedies, and the other with the usual remedies only. Having induced hypnotic sleep, he suggested to the patient that the one arm should be cured painlessly and without any suppuration; and it did in fact heal, by simple separation of the slough and healthy granulation, ten days earlier than the other, which went through the suppurative process, accompanied by inflammation and pain. Tuckey[53] adds: "Were this case not reported by a well-known savant, I confess I should feel some hesitation in recording it here; as it is, its accuracy is beyond doubt."

Professors Bourru and Buret, of Rochefort, succeeded in causing hæmorrhage from the nose by suggesting that it should take place in a young soldier of epileptic and hysterical constitution; they even fixed the hour when it should come on. On this same subject Dr. Mabille[54] of the lunatic asylum at Lafond, produced instantaneously, by suggestion, hæmorrhage from different parts of the body, exactly similar in character to the stigmata of some mediæval saints.

Prof. H. C. Wood[55] has recently experimented upon the therapeutic effect of hypnotism without suggestion in two cases; one of tremors simulating paralysis agitans; the other a sufferer from paraplegia.

The history of the first case was that some years previously the woman had been attacked by tremors like those now present, but had recovered after three years' illness; that about three months before entering the ward of the hospital the tremors had returned. They had stopped at one time for two weeks, but when the case was taken in charge they were continuous in one arm, and exactly simulated those of true paralysis agitans. This woman was found to be a good subject for hypnosis. The tremors continued during the hypnotic sleep. No hypnotic suggestions whatever were made to her, but the second

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[53]Psycho-Therapeutics or Treatment by Hypnotism. Wood's Medical and Surgical Monographs, vol, iii, p. 755.

[54]Op. Cit., vol. ii, p. 754.

[55]Lancet, Jan. 11, 1890: Amer. Jour. Med. Sc., vol. llxix, p. 286.

treatment was followed by great lessening of the tremors, and four treatments sufficed for a cure.

In the second the paralysis of the legs was almost complete, associated with irregular patches of anæsthesia on the legs, absolute loss of the patellar reflexes, and great complaint of weakness and numbness in the arms. The woman had not the appearance of being hysterical, but the diagnosis of hysterical paraplegia had been made by Dr. Dercum. The ordinary treatment had been instituted without avail. During the hypnotic treatment no suggestions were made to the patient. After the second seance the numbness disappeared from the arms; after the third the woman was able to stand; after the fifth she could walk. after eight treatments she was able to walk long distances, stand very well on one leg, and was about to go from the hospital as cured, although her knee jerks had not returned.

Dr· Wood does not commit himself to any theory as to the method in which hypnosis produces cure, although as yet he does not see why all the effects obtained cannot be accounted for on the theory of mental influence. For the exertion of such influence it is not essential that the physician should speak to the patient specifically about his or her case; especially is this true at the Paris and Nancy Clinics, since the whole atmosphere is heavy with faith. The patients come to be cured of their diseases; they undergo a process which to the ignorant is most mysterious, and which even educated people must, until they are accustomed to it, look upon as ' uncanny." The elements of profound mental impression are all present, and it needs no words of the physician to bring them into action.

In discussing this branch of the subject with the admission that we are not yet prepared to estimate the full value of the *mental* effect of much of our operative work I cannot refrain from an allusion to its application to the current statistics in a particular line of abdominal surgery.

In these days of somewhat indiscriminate oophorectomy many cases are operated upon and are truthfully reported as "cured" when, to the unprejudiced eye, but little actual disease appears to have been found.

When one recollects how many such cases undergo an unaccountable spontaneous cure, how often the symptoms cease after some mental impression or physical shock, or a perseverance in some extraordinary position, how many fruitful but painful ovaries have been saved by

Dr. Weir Mitchell's systematic treatment, and how often it has happened that a threatened, simulated, or imperfect operation has been enough to frighten or charm away all acquaintance with suffering, doubt falls upon both the asserted necessity and the reputed success of the operation itself. It can never be determined how much is due to the amputation, how much is a psychical phenomenon. How many women have been doomed to sterility that would have been equally relieved by a farce or a failure, can never be made out. But it is a query which takes the gloss off a mass of statistics.[56]

3. *Relief of tension.*—Although it is not true that in every case described in this paper relief of tension was afforded, there can be little doubt that this was an important factor in many of them. Assuming that if preternatural tension existed in the cranial cavity, it would be relieved to an extent by trephining, we find few exceptions to the rule that in each case something was done which lessened tension in a cavity or organ of the body.

With respect to the meaning of the word "tension" as employed in surgical work, and particularly in clinical work, Bryant's[57] definition may be accepted. According to him it means the pressure brought about by the stretching or distension of tissue from either the growth of some neoplasm or the effusion of some fluid; tension, in this sense, meaning distension or the stretching of parts by a force acting from within—by centrifugal pressure.

In some of the cases, as those of supposed renal calculus, for example, the relief afforded by the division of the capsule of a possibly engorged and swollen viscus may be readily understood. The application of the principle to cases of epilepsy is not so clear.

Dr. Thomas Oliver,[58] after reporting a partially successful case of trephining for epilepsy (see table) says: "Gowers speaks of having seen or heard of 65 cases of epilepsy owning a traumatic cause, and of trephining as the only line of treatment likely to be successful, and

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[56]Sir Spencer Wells, Amer. Jour. Med. Sc., vol. llxii, p. 467-8.

[57]Tension, as Met with in Surgical Practice, by Thos. Bryant.

[58]British Medical Journal, Feb. 4, 1888.

that, be it remarked, as in my own case, where neither disease of bone, membrane or surface of the brain was found at the time of operation. Relief comes either from the operation acting as a strong counter irritant lasting all through the period of healing, or from the reduction of tension consequent upon the escape of pent-up serum."

In the cases of abdominal section, especially those attended with the presence of tympany or ascites, the powerful influence upon the whole economy produced by the relief of tension is obvious. Braxton Hicks[59] has well described the conditions in such a case.

The effects of the pressure on the circulation would be similar to that which takes place during inspiration, only that it would be constant and more severe, whilst the "respiratory tension" would increase it still more. Thus the blood on endeavoring to enter the abdomen would be retarded both from above and below, and the return current from the lower extremities would be impeded, with this additional disadvantage that the aorta, although itself pressed upon, yet would overcome the resistance better than the veins; and this would increase the venous turgescence and engorgement in the legs, and produce a tendency to œdema. The same effect, though not so marked at first, would take place above the abdomen, partly by the difficulty of executing the respiratory act, and partly by the detention of the blood in the aorta, and the consequent embarrassment of the circulation in the heart. The portal system would be interfered with, and the return current from the lower rectum impeded. The general circulation in the portal system would be checked, and this, with the retardation of the cardiac current, would tend to engorgement of the liver. In like manner would all the abdominal organs be interfered with and their proper action checked. The kidneys, for instance, would find greater difficulty in excreting urine, and what quantity was formed would find a difficulty in making its way into the bladder because of the pressure on the ureters. The bladder also would be less able to expand. Again, the pressure on the intestinal structures would retard the functions of assimilation, and the nutrition of the body would be thereby diminished. Also pressure on the sympathetic ganglia and nerves tends to depression of their functions, and notably the cardiac, thus forming one, and not the least, factor of many that lead to death in abdominal diseases.

[59]The Proceedings Med. Soc. of London, vol. vi, pp. 336-337.

Muret,[60] in an elaborate article on the treatment of ascites by far-adization of the abdominal walls, has called attention to the fact that all the methods which have been employed with success in the treatment of ascites have in some way produced a diminution of intra-abdominal pressure. He includes the use of purgatives and of early tapping and in relation to the latter refers to the papers of Murchison, Gintrac, Austin Flint, Ewald, Jacoby and others.

His own results are exceedingly interesting in their relation to the question of the influence of abdominal tension.

A diminution of this tension would manifestly alter the blood supply to any important organ in the body and with it the nutritive processes, local and general, but we can say no more with definiteness except as it applies to cases of ascites, in which, as in cases of hydrarthrosis, one tapping may prove permanently curative because the original source of irritation and hypersecretion had already disappeared.

4. *Reflex action.*—Under this head may be included the "reaction of traumatism", as well as the effects of revulsion and counter-irritation.

Verneuil,[61] in a paper calling attention to the influence exerted by prior lesions of the liver on the progress of traumatic lesions, long ago emphasized the fact that any traumatism, however slight, sometimes excites in the entire economy a general perturbation and sometimes by a kind of selection of the weak point a sudden and violent aggravation of lesions that are only slight or that slumbered.

It seems to me that this same excitement, usually prejudicial, may occasionally be curative, although it must be admitted that these are vague terms and that even if the explanation is correct it is yet far from final.[62]

In endeavoring to account for the cause of cure in the case of spinal surgery already detailed (see page 37) Dr. Dercum and I were compelled to invoke this reaction of traumatism. We discussed the case as follows:[63]

[60]Revue de Médecine, Paris, 1888, vol. 8, p. 719.

[61]Gazette Hebdomadaire, Oct. 8. 1875.

[63]ANNALS OF SURGERY, July, 1890.

"A question of great theoretical as well as practical interest now presents itself. In looking back over the case, we ask ourselves what is the rationale of the recovery? What was it that the knife accomplished that resulted so happily to the patient? Evidently it could not have been the mere relief of pressure. The cord lies loosely within the spinal canal,and the dural thickening observed by us could not have encroached materially upon its territory. The adhesions, however, must have played an important part in the production of the symptoms, and the actual service accomplished by the knife is here very evident. That, however, the adhesions were sufficient of themselves to explain all of the symptoms it would be absurd to assume. Doubtless the case was one in which a more or less diffuse myelitis existed, associated in the upper dorsal region with a marked meningitis, the latter involving both membranes. In this way only can we account, on the one hand, for the pain elicited on percussive flexion and transmitted shock, and, on the other, for the widespread paralysis and the trophic changes.

Is it not proper, then, to assume that the result achieved in this case is due, not alone to the laying open of the dura and the destruction of adhesions, but also to a reaction of nutrition, the result of the surgical trauma? Certainly surgery is not wanting in instances of such reaction, as witness the occasional recovery in tubercular peritonitis as a consequence of laparotomy. It would seem as though the local shock had been promptly followed by a corresponding reaction in which the vitality of the tissues had been raised sufficiently high to determine a return to the normal state. Certainly the case before us is not only unique but exceedingly suggestive."

As evidence of the extraordinary pathological changes that may be brought about by factors but little understood, I may instance the experiments of E. Mendel, (*Neurolog. Centralblatt*, May 15, 1884 , who, believing that hyperæmia was an important feature of the early changes in general paralysis, sought to excite an intense chronic hyperæmia in dogs. For this purpose he fastened the animals on a revolving table with their heads toward the periphery. Rapid revolutions, 125 to 130 a minute, continued for half an hour, produced punctate hæmorrhages. Slower revolutions (110) for six minutes a day, produced, after some weeks, symptoms of general paralysis, and, on killing the animals, he found adhesions between the skull, the meninges, and the brain, an increase in the nuclei and cells of the glia, an increase in the number of vessels, and changes in the ganglion cells. This condition finds a clinical representation in a case recently reported by Bernhardt (*Deut. Med. Woch.*, March 29, 1888), where symptoms of general paralysis developed gradually after a railway injury. Furstner (J. Holland, *Archiv. f. Psychiatre u. Nervenkrankheiten*, vol. xix, p. 438, 1888), has reported Mendel's experiments with fewer revolutions (60 to 80) for a shorter time (1 to 2 minutes) and continued for months. He found

double primary degeneration of the lateral columns and of a particular part of the posterior columns, changes in the optic nerves, and changes in the brain similar to those found by Mendel. Similar changes in the lateral columns have been found after death, in patients who have suffered from "concussion," by Dumenil and Petel, and also by Edes, (*Boston Med. and Surgical Journal*, September 21, 1882. —(Nervous Affections following Injury, by P. C. Knapp, *Boston Medical and Surg. Jour.*, vol cxix, part 2, p. 451, 1888).

But there may be more than local shock to account for marked changes in either pathological or normal structures. The reciprocal influence of one portion of the body on another in both health and disease is a most interesting but as yet unsolved problem. Many years ago Tholozan and Brown Séquard showed[64] that by lowering the temperature of one hand a sensible reduction of the temperature of the other could be brought about without affecting the general temperature of the body. This we can now understand. But what is the relation between the parotitis of mumps and the orchitis which so often complicates it? Why do a certain proportion of the cases of severe burn die from perforating duodenal ulcer? Why do we have amaurosis from dental caries or paraplegia as a result of renal calculus? Why, in a gouty person, is the swelling of the metatarso phalangeal joint of the great toe accompanied by a disappearance of the gastric dyspepsia? Why are liver diseases associated with retinal change or mucous polyps with asthma?

While the majority of such questions as these remain unanswered, we can scarcely venture to deny the possibility of operative interference at least occasionally producing curative effects though the rationale of its action remains a mystery. Still more striking examples of the reciprocal influence of tissues remotely connected are to be found in the few carefully observed cases of so-called "maternal impressions" among the host of nonsensical cases of the same sort that have found their way into the journals.

One of the most remarkable of these cases has been recorded by Dr. William Hunt.[65] A woman when eight

[64] See a paper by Dr. John Ashhurst, on "Nervous Action." Amer. Jour. Med. Sciences, vol. xl, p. 105.

[65] Amer. Jour. Med. Sc., vol. lxxxi, p. 186.

and a half months pregnant, received extensive burns of the surface of the body. Labor came on the next day and a well-formed but dead female child was born, apparently blistered and burnt in extent and in places almost exactly corresponding to the injuries of the mother. The figures which accompany Dr. Hunt's article are exceedingly striking and it is difficult to believe that the occurrence was simply a coincidence.

There remain some special points in connection with abdominal tumors and with peritoneal tuberculosis which require mention. We should not ignore the possibility of the spontaneous disappearance of a tumor, the relation to the operation being coincidental.

Dr. Thos. Dwight has reported such a case in which a large, hard, rectal tumor disappeared, and says there seems to be little doubt that tumors of various kinds do, though very rarely, disappear without surgical interference.

Esmarch, of Kiel, told Paget that he had seen cases of recurrent fibroid tumor cured, and not again returning, in patients who had taken large doses of iodide of potassium for several weeks. Dr. Duhring reported in *The Archives of Dermatology* for January, 1879, a remarkable case of so-called inflammatory fungoid neoplasm. In brief, a woman, otherwise healthy, for some two and a half years before her death had a great number of tumors, chiefly in the chorium or subcutaneous tissue, which presented the most surprising variations of size, sometimes entirely disappearing. The microscope showed them to consist essentially of a hypertrophy of the fibrous elements of the chorium, and a varying amount of granular and other cells.

Dr. Coats exhibited for Dr. Gairdner specimens from a similar case before the London Pathological Society in April, 1879. The tumors were found also in the connective tissue at various places inside the abdomen. The growths were held to be lymphadenomatous. Sir James Paget made some remarks in the discussion which deserve to be reproduced. He said "the report of such a case was useful, as likely to help in the explanation of these rare instances in which tumors diagnosticated to be cancerous had disappeared after a time. He suspected that there was a greater number of such cases on record than might be imagined, and the collection of them would be an interesting and important undertaking. Three cases of the disappear-

ance of tumors in this way were known to himself.   One was in the person of a young man who had suffered for two or three years from what appeared to be ordinary lymphadenomatous growths in the neck, axilla and groins.   Within a week these tumors all suddenly disappeared, but the patient then began to suffer from dyspnœa, and soon afterward died.   Another case he regarded as one of multiple medullary cancer (what would now be called small celled sarcoma), and the microscope corroborated this diagnosis.   The growths occurred on the neck and axilla.   There was a very large mass over one deltoid, which suppurated and sloughed, during which process nearly all the other growths disappeared.   The man recovered, and enjoyed good health for some months, but the growth afterward recurred and caused death. The third case was one which he had diagnosticated as medullary cancer of an undescended testis.   There was a tumor as large as two fists, and he had prescribed liquor potassæ and iodide of potassium, under which treatment the mass soon entirely disappeared.   In eight or ten weeks, however, it recurred, but disappeared again under the same treatment.   This also happened a third time, but having recurred a fourth time, it was no longer amenable to treatment, and the patient died.   The microscope confirmed his original diagnosis as to the nature of the growth."   Other gentlemen mentioned somewhat similar cases.

An interesting paper on the sudden disappearance of tumors, by Dr. Fischer, of Breslau, is to be found in the *Deutsche Zeitschrift f. Chir.* vol. xii, 1879.   Dr. Fischer calls attention to the fact that in certain very prostrating diseases tumors of some kinds suffer a great reduction in size, and among these are sarcoma, adenoma, and swellings of lymphatic glands.   The cases he reports are chiefly of enlarged lymphatic glands and of enlarged thyroids.   Some of the glandular tumors were greatly affected by the removal of other tumors.   One of the enlarged thyroids returned to its proper size during a light attack of scarlatina.[66]

Eve cites (Eve's Surgical Cases, p. 816) from Warren on Tumors, case of female with tumor of submaxillary gland, size of egg, very hard; removal advised, but patient objected.   Active local treatment for a number of weeks made no improvement.   Patient finally asked if an application recommended to her would be safe; this was an application of a dead man's hand three times to the diseased part. Being assured no harm could result, the application was made, and she reported later with the tumor actually gone.

[66]The Disappearance of Tumors, Boston Med. and Surg. Jour., 1880, vol. xxvi, p. 562.

As to the cure or amelioration of growths thought to be malignant by a merely exploratory operation, the idea seems opposed to all our modern theories as to the etiology and causation of such neoplasms. A long search through the literature of the subject has been met with but little success. Few claims of permanent cure by any methods short of complete excision are made by respectable authorities, and we all know how lamentably rare are such cures even after the most thorough removal.

Perhaps the most interesting case which I have found is one, that of Dr. Twitchell, of New Hampshire, a well known surgeon of New England, recorded by Dr. H J. Bowditch.[67] His grandmother had died of carcinoma mammæ; his sister of scirrhou; pylorus. At the age of 60, a small hard tumor developed at the internal angle of the right eye. Three years later this had become so large that it was removed by operation, but promptly returned, and became a ragged, hard, elevated ulcer, thought by Dr. Bowditch and the patient himself, and a number of eminent surgeons, to be undoubtedly malignant. All local applications failed to modify its course, and Dr. Twitchell finally decided to give up all use of medicines internally, or of external applications, but to try a course of the most rigid diet. Starting from a theory that malignant diseases arise from the fact that we take too much carbon into our system, he determined to live, from that time, upon a bread and milk diet, and if, at the end of some months, he did not find any diminution in the disease, he determined to use nothing but bread and water. The immediate result was most favorable, and Dr. Bowditch two years later could scarcely discover the cicatrix. Whether it was Dr. Twitchell's diet, or his belief in it, that was the effective agent cannot be determined.

Other and final points deserving of special mention, as they do not fall in satisfactorily with any of the suggested explanations, but may, perhaps, be better understood on general pathological grounds, are the relief of abdominal pain and the cure of tubercular peritonitis by so-called simple exploratory operation.

As to the first point the experience recorded by the follow-

[67]Charleston Med. Jour., November, 1849.

ing writer has, undoubtedly, been that of many others and clears up much that is otherwise mysterious.

Sir Spencer Wells[68] says: In my fifth case the two ovaries had been amputated by surgeons of renown in Holland, at different times, without permanent benefit. At my operation there was no trace of another ovary, and what I did was to separate part of the omentum and a coil of the small intestine from the uterus to which they were attached, and to divide another piece of omentum which adhered to both the fundus uteri and the cicatrix in the abdominal wall. Here the two castrations did no good. The liberation of abnormal connections near the seat of the pain was what was wanted, and must be regarded as something more than the completion of the two oophorectomies.

L. Prochownick is of the opinion that much of the success claimed for operative interference in tubercular peritonitis is attributable to errors of diagnosis, and that the same also applies to other forms of peritoneal inflammation. He believes that after many cases of acute pelvic peritonitis adhesions of the omentum to the pelvic organs occur and give rise to intestinal and gastric symptoms, such as vomiting, gastralgia, nausea, abdominal distension, rectal and vesical tenesmus, constipation or diarrhœa. Adhesions to the generative organs in the female cause dysmenorrhœa, umbilical pains, etc. It may well be that in many cases of so-called exploratory abdominal incision followed by the disappearance of this or similar symptoms, the good result has been obtained by breaking up of these omental adhesions.[69]

Howitz states that he has observed several cases in which he performed laparotomy for relief of severe pain, attributed to disease of the adnexa, and found adhesions between the omentum and the posterior surface of the symphysis pubis. The pain was entirely relieved by simply detaching the adhesions. The patients were under observation sufficiently long to demonstrate the fact that the relief was permanent. He details an interesting case of a patient, æt. 36, who had suffered from abdominal pains since the age of 17, and had been treated for ulcer of the stomach, for pelvic trouble, had used pessaries, had tried massage, etc. Separation of the omentum from the symphysis in this case resulted in a complete cure.[70]

[68]Amer. Jour. Med. Sci., vol xvii, p. 467.

[69]Deut. Med. Woch., No. 24, 1889; ANNALS OF SURGERY, October, 1889.

[70]Cent. f. Gynakologie, August 3, 1889.

In this relation the following communication from Dr. H. C. Coe, of New York, is of much interest.

The expression "exploratory incision" or "exploratory laparotomy" has been used quite loosely to signify an abdominal section in which there has been no actual *removal* of a diseased organ or neoplasm In my opinion this leads to serious error when we come to estimate the results of these operations, since we are constantly liable to regard an "exploration" as synonymous with an "incomplete" section My idea of a pure "explorative laparotomy" is one in which a small incision is made, and the finger is introduced for diagnostic purposes, and is withdrawn as soon as the diagnosis is settled, *without any further manipulation.* If adhesions are broken up, if a displaced organ is replaced, if a sac is emptied by pressure (such as evacuation of the contents of a pyosalpinx into the uterus), this manipulation ceases to be a pure exploration, and is to be regarded rather as an "incomplete" ovariotomy, in which an adherent cyst is emptied and stitched into the wound. In this strict sense an abdominal incision with the evacuation of even a small quantity of ascitic fluid is not a simple exploration, since the removal of the fluid implies more important results than a pure digital exploration without further interference. This may seem like a refinement of terms, but I would simply call attention to the clinical side of the question. Very few operations reported as purely explorative are rightly so termed. We open the abdomen, find that we have to do with pelvic tumors which are firmly adherent, and decide not to remove them, but rarely stop there. Either intentionally, or in attempting to make a more thorough examination, we separate adhesions (perhaps very slightly) and find that our patients are considerably relieved. This result often appears miraculous I have seen it repeatedly, but it is rarely, or never, permanent, since the adhesions naturally tend to reform. Again, the removal of ascitic fluid (perhaps only a small proportion of the whole amount) without removal of the *cause* may result in decided benefit, whether by a change in the intra abdominal circulation, by relieving pressure, or (as Tait thinks) by direct atmospheric influence, we can not say—that it does is an established clinical fact It is unnecessary in this connection to refer to the value of drainage in cases of uncomplicated tuberculous ascites, since these come under another category. Lastly, I cannot recall a case in which digital exploration *alone* (without separation of adhesions or evacuation of free or confined exudation) has ever *permanently* relieved *bona fide* symptoms. When it has apparently done

so, there has been a strong neurotic element present, so that it was difficult to determine whether the cure was not more *moral* than *phys ical.* Personally, I can not understand Mr. Tait's statements regarding the disappearance of abdominal tumors after pure explorative laparotomy (as I have defined it), where *nothing else was done except to open the abdomen.* The question arises, might not these tumors (such as fibroids) have diminished spontaneously?

New York, March, 18.

Dr. A. W. Johnstone, of Cincinnati, writes me somewhat to the same effect.

My belief is that in abdominal surgery where the relief, of which you speak, comes, that there has been a low peritonitis, or else a papillomatous growth, which has been overlooked by the operator and which is cured by the alteration of the nutrition, incident to the operation. For an instance, in the practice of my former assistant, Dr. Harry Gowen, of Danville, Ky., in his first lapa otomy for a supposed traumatic peritonitis (from a blow on the abdomen) there was no serous effusion into the cavity, and nothing could be found except a general reddening of the peritoneum. The drainage tube, however, discharged quite freely for several days and the patient was completely cured. An untrained eye would have taken this for a healthy perito neum, but I am sure there was a low form of inflammation which the dra nage cured.

In this same way simple papilloma of the peritoneum I have seen cured by drainage. I have also seen it disappear after simple incision when no drainage tube was left.

I think papilloma of the peritoneum is like papilloma anywhere else, it sometimes takes a very slight alteration of the nutrition to make it entirely disappear. It is so frequently seen in the papilloma of the fingers of druggists.

In conclusion, I would say, that my belief in regard to these cases is, that there is a true pathological condition which has been overlooked in the operation, and that in proportion to a man's experience in abdominal work, you will find inversely a number of these cases occurring.

Cincinnati, Ohio, March 26, 1891.

Finally, as to the rationale of the cure of tuberculosis of the peritoneum. Peritoneal tuberculosis is dependent upon extension of the tubercular inflammation from adjacent organs, or to

direct infection by means of the bacilli circulating with the blood. Phillip's pathological studies showed that of 107 cases of tubercular peritonitis, the lungs were involved in 99, the pleura also in 60, and the bowel in 80. The frequency of intestinal invasion by tubercle is well known. The serosa becomes quickly involved, but this involvement may remain strictly localized, and may undergo spontaneous resolution if the original source of infection, the intestinal lesion, cicatrizes, as autopsy findings show that it frequently does. When, however, the peritoneal involvement comes from a large organ, and is extensive, it is as difficult to conceive the rationale of spontaneous resolution as it is to explain in what way operative procedure, excepting that of total ablation of the disease, can possibly be of the slightest avail. Yet the fact remains that a gratifying percentage of success follows simple opening and intra-abdominal manipulation in cases of tubercular peritonitis.[71]

Tait says, with his usual positiveness, that a therapeutic change is effected in the peritoneum itself by a mere opening of the cavity, and calls attention to the distressing thirst which is uniformly produced by opening the cavity only a finger's breadth, but is not seen if the operation stops short of that.

The matter cannot be dismissed so easily, however, but may, perhaps, be better understood by a reference to the circumstances, and the general pathological laws that apply to them.

Cabot[72] has recently summarized the evidence at present in our possession in regard to the method by which simple laparotomy cures tubercular peritonitis. He calls attention to the fact that Hirschfeld and others have shown that the tubercles actually disappear from surfaces where they have been known to exist, and quotes Van de Warker in reference to the two ways in which the accumulation of ascitic fluid may, perhaps, act to intensify the morbid process; first, through its mechanical irritation by pressure, or by some unexplained irritating quality in its constituents; and, secondly, by acting as a medium for the propagation and distribution of the tubercle ba-

[71]University Medical Magazine, November, 1890.
[72]Papers on Abdominal Surgery, Boston, 1891.

cilli. This explains the effect of the effusion in favoring the spread of the disease, but there still remains to explain the actual disappearance of already existing tubercles, which follows the removal of the effusion. Upon this point, Van de Warker says: "The irritated peritoneum is given a rest, and allows of a process that belongs, *per se*, to tuberculosis, namely, the thickening and induration of the surfaces—an incapsulation—and which, Hegar suggests, may be a stage in spontaneous cure." Cabot thinks "that this suggestion of Hegar's is of the greatest interest, and that it is probable that the rest afforded to the peritoneum is of importance in allowing it to set up its process of induration, and so to resist the advance of the tubercles."

When, however, the ascitic fluid is wholly removed, and the peritoneal surfaces fall together and acquire adhesions, the tubercles are then shut in between the coils of intestine, the omentum and the abdominal wall. They are thus surrounded by tissues in a high degree of activity, which can now throw around them the limiting zone of young cells, and eventually fibrous tissue, which, if the tubercular process is not too far advanced, may effectually resist it and cause it to retrograde, the process being analogous to that which we see imperfectly going on around a cancerous growth.

It rarely happens that the vigorous growth of a cancer is definitely arrested by this effort of the surrounding tissues; for while it is held in check in one direction, it extends itself in many others, and breaks through the comparatively feeble barriers thus opposed to its progress. In tuberculosis, however, we have a process of much less vitality, and which, occurring in younger subjects, is often successfully hemmed in and destroyed by the healthy tissues about.

The conclusions which seem warranted by the foregoing facts and considerations are as follows:

1. There are large numbers of cases of different grades of severity and varying character which *seem* to be benefited by operation alone, some of them by almost any operation.

2. These cases include chiefly epilepsy, certain abdominal tumors, and peritoneal effusions and tubercle, though the im-

provement in the latter is, perhaps, to be explained on general principles.

3. Of the possible factors which, by reason of their constancy, must be considered, anæsthesia seems least likely to have been effective. The other three, viz., psychical influence, relief of tension, reflex action, may enter in varying degrees into the therapeutics of these cases, and taken together, serve to render the occurrence of occasional cures less mysterious.

4. The theory of accident or coincidence scarcely explains the facts satisfactorily.

CONTRIBUTION TO THE KNOWLEDGE OF SARCOMA.[1]

By WILLIAM B. COLEY, M.D.,

OF NEW YORK.

I.   A CASE OF PERIOSTEAL ROUND-CELLED SARCOMA OF THE
     METACARPAL BONE; AMPUTATION OF THE FOREARM; GEN-
     ERAL DISSEMINATION IN FOUR WEEKS; DEATH SIX WEEKS
     LATER.

II. THE GENERAL COURSE AND PROGNOSIS OF SARCOMA, BASED
     UPON AN ANALYSIS OF NINETY UNPUBLISHED CASES.

III. THE TREATMENT OF SARCOMA BY INOCULATION WITH
     ERYSIPELAS, WITH A REPORT OF THREE RECENT (ORIGI-
     NAL) CASES.

I. THE patient a young lady, æt. 18, had been in perfect health from earliest childhood. The family history was likewise good with the exception of a remote tubercular tendency, and the fact that an ancestor, three generations before, had died of "cancer" of the lip, presumably epithelioma.

In the early part of July, 1890, she received a slight blow upon the back of the right hand. The hand became a little swollen and somewhat painful the first night. The next few days the pain became a trifle less and the swelling subsided, but did not entirely disappear. About a week later the swelling again began to increase very slowly, and the pain became more severe. She consulted a physician at the time of the injury, but there being no evidence of anything more than an ordinary bruise the usual local applications were applied.

August 12. The pain and swelling continuing, she again sought

[1] Read before the Surgical Section of the New York Academy of Medicine, April 27, 1891. (With a report of three cases treated since).

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medical advice and as motion seemed to aggravate the pain, the hand and wrist were immobilized with a straight palmar splint.

This gave patient but only temporary relief. During September the swelling and pain both gradually increased. The pain was constant, usually dull, but sharp and shooting at times, and much worse at night, generally keeping the patient awake from one to two hours every night. It was always much relieved by letting the hand hang down as low as possible.

On October 1 the patient came to New York for further surgical advice and was referred to me. A careful examination at that time showed a small fusiform swelling about the size of half an olive upon the dorsum of the right hand, and situated just over the middle of the fifth metacarpal bone. The skin over this was perfectly normal.

There was an indistinct sense of fluctuation on deep pressure, but as pressure was so painful this fact could not be clearly made out The base of the swelling was not distinctly outlined, there being a gradual shading off into the surrounding tissues.

There was a slight local increase in temperature The ring and little fingers were held in an extended position and any attempt to flex them at the metacarpo-phalangeal joint caused pain. On the palmar side there was a slight induration corresponding in position to the swelling on the dorsum. There were no enlarged glands in the axilla.

As local applications had been very thoroughly tried, and as a second and more careful examination on October 3 made me inclined to regard the nature of the trouble as probably a subacute periostitis, I decided to make an incision. Under cocaine I cut down to the bone through the center of the swelling. On reaching the vicinity of the periosteum a small amount (few drops) of what appeared to be thin pus mixed with blood escaped, but no collection could be found. The tissues cut seemed abnormally hard and more of a grayish color than normal.

The wound was packed with iodoform gauze and a small wet antiseptic dressing applied, the hand being kept at rest on a long splint. When the packing was removed there was scarcely any discharge. The pain had not been relieved by the incision. The hand was dressed daily with wet carbolic compresses (1-60)

The following week as the pain and swelling were slowly increasing I thought it better to seek further advice and accordingly consulted Dr. William T. Bull.

He was inclined to regard the trouble as a periostitis, probably of tubercular nature, and advised waiting for further developments.

As the symptoms continued to increase in severity, I decided to make a more thorough exploration and on October 14 I gave her ether and enlarged the wound.

The metacarpal bone was bared a distance of three-fourths of an inch. The bone itself showed no evidence of disease, but the periosteum was thickened. No collection of pus could be found.
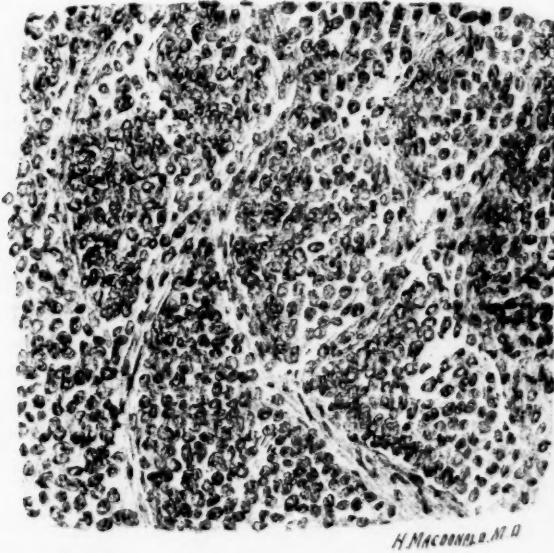
FIG. I.—MICROSCOPICAL APPEARANCES PRESENTED BY SARCOMA OF METACARPAL BONE (CASE I.)

The grayish granulations were scraped away and the wound was dressed with iodoform gauze. The pain was somewhat relieved for a day or two and then returned as severe as before. Although there was no suppuration the redness and swelling increased. The base of the swelling showed no line of demarcation but slowly extended in all directions, and movements of the fingers became more and more painful. The induration upon the palmar side, which at first was very slight, had now become well marked and over a small area, one-half an inch in diameter, the skin was reddened and showed signs of softening.

There was also a gradual loss of sensation in the ring and little

fingers. The pain soon became so severe that I was obliged to give morphine to secure relief. The increase of pain. the gradual impair- ment of motion, the increasing loss of sensation, together with the general appearance of the swelling and the absence of the usual signs, characteristics of an inflammatory trouble, led me to suspect the pos- sibility of malignant disease, probably sarcoma.

I again had a consultation with Dr. Bull, and as the nature of the trouble was still very obscure it was thought best, at his suggestion, to seek additional advice, and accordingly Dr. Robert F. Weir was called in. The suspicion of malignant trouble was considered sufficient to warrant the removal of a small portion of the tissues for microscopical examination. Two days later the patient was given nitrous oxide gas and a small wedge-shaped piece removed from the edge of the old in- cision. This was very carefully examined by Dr. Walter B. James, Assistant Pathologist of the New York Hospital As so much de- pended upon a thorough examination and an accurate diagnosis, sev- eral days were required before the result could be known.

On November 6, Dr. James reported the portion examined to be from an alveolar, round celled sarcoma. (Fig. 1).

On the following day after a consultation, with Drs. Bull, Weir and McBurney, it was decided that amputation at the middle of the fore- arm offered the best chance of saving the patient's life.

The next day, November 8, I amputated at the forearm at about the middle. No enlarged glands could be detected in the axilla. The patient suffered very little from the shock of the operation and the stump healed satisfactorily. The appetite remained very poor and she did not regain strength as rapidly as I had hoped.

There was no appreciable loss of flesh and no fever, but the pulse continued abnormally high (100-110), as it had been previous to the operation. Three weeks following the operation she had an attack of severe abdominal pain, localized in the epigastrium, and lasting two or three days. There was no indiscretion in diet that could account for it. There was a small area of resistance in the region mentioned, which was quite tender on pressure. After a few days the pain ceased, and the abdomen was apparently normal.

On December 11, four and a half weeks after the amputation, a small nodule was discovered in the upper portion of the right breast. It was about the size of a small almond and was very tender on pressure. It was quite painful, the pain being sharp and shooting, but not con- stant. The other breast, as well as both axillæ, were carefully exam- ined and nothing found.

The following day the nodule had perceptibly increased in size, and two similar but smaller nodules had appeared on the left breast.

Dr. Bull again saw the patient and the nodules were considered undoubted evidence of a recurrence, but as it had been so rapid and at the same time general, we thought it best not to attempt removal of the tumors in the breast unless very rapid increase in size and the severity of the pain should demand it as a means of affording temporary relief. About the same time she began to have severe neuralgic pains in the left thigh. The strength began to fail and there was almost complete anorexia.

One week after the recurrence in the breasts the glands in the axillæ became enlarged and painful. The nodules in the breasts increased in size and became more numerous. The pain was so severe that the patient had to be kept under the influence of opiates. She was able to go out walking and driving until December 25, and then she became too weak.

At this time a slight induration appeared in the epigastrium It was tender on pressure and the seat of a dull pain.

December 28. A small area of anæsthesia appeared on the lower lip and chin, and patient also complained of numbness in lower incisor teeth. This zone of anæsthesia slowly increased in size and remained until death.

January 1. Slight icterus was noticed in the conjunctivæ, and a little later in the skin. This rapidly increased and a week later marked jaundice was present and the urine contained a large amount of bile.

Smal nodules about the size of a split pea now began to appear in the skin of the chest and abdomen, and the lymphatic glands just above the inner condyle of the right arm became enlarged and painful.

From this time the loss of flesh and strength was very rapid. She could take almost no nourishment, even liquids causing severe pain in the abdomen.

The induration in the abdomen increased in size and January 9, on deep palpation, a well-defined tumor could be felt occupying the whole of the epigastrium. It was firmly fixed and was lost at the edge of the ribs.

The liver was enlarged and its lower edge fell below the free border of the ribs.

The heart's action, which, up to this time, had been good, now began to fail, and became very weak and irregular. It responded well to digitalis, which was given in fairly large doses. Brandy was also

given for two or three days, but could be no longer borne by stomach.

The urine January 11 was high colored, very small in quantity, contained a large amount of bile pigment, and a trace of albumin. Microscopical examination showed hyaline, epithelial and granular casts, and renal cells. Examination of the chest showed slight dulness over upper portion of the right lung with expiratory murmur roughened. A little later crepitant râles appeared in subclavicular region in front. The heart sounds were all abnormally loud, and there was a soft systolic murmur at the base.

January 20. She began to vomit and this continued once or twice a day. The vomitus consisted of only mucus or liquids that had been taken into the stomach.

January 21. Vomiting increased in frequency and vomitus contained blood in quite large amounts. The attacks occurred almost hourly, and were very exhausting to the patient in her extremely weak condition.

January 22. The blood was no longer seen but the vomiting continued, and the matter ejected was a thin, dark liquid, evidently biliary in character.

She was conscious up to a few minutes previous to death, which occurred on Friday, January 23, at 7 A M.

She had taken practically no food for two weeks. The bowels had not moved for twelve days, and no urine had been passed in forty-eight hours, and the bladder was empty.

At the time of death the tumors in the right breast had reached the size of a goose egg, and were made up of several hard nodular masses slightly attached to pectoral muscle and firmly adherent to the overlying skin. The glands in both axillæ were enlarged and hard. The left breast was almost as extensively involved as the right, but the mass was less protuberant and the skin less adherent. The whole epigastrium was occupied by a tumor (intra-abdominal) about the size of a child's head, hard, coarsely nodular and almost absolutely fixed. The lower boundary only could be made out by palpation, its upper being loose at the free border of the ribs. This was undoubtedly connected with the stomach, and the liver and omentum were also probably involved.

The skin over the entire body was infiltrated with small, shot-like bodies varying in size from a No. 4 shot to a split pea. These were far more numerous over the chest, abdomen and back than the extremities, and during the last few days of life they began to be pigmented. There was no autopsy.

The rapid course of the primary disease, the extensive general dissemination that followed so quickly the attempt at removal, show the intensely malignant character of this growth.

A disease that, starting from an insignificant injury, can attack a person in perfect health, in the full vigor of early maturity, and in some insidious, mysterious way, within a few months, destroy life, is surely a subject important enough to demand our best thought and continued study.

II. In the hope that some little light might be thrown upon this obscure subject, that some aid might be given toward making an earlier diagnosis and, consequently, a more hopeful prognosis, I have been led, not only to report this case in detail, but also to add a few remarks upon sarcoma in general, based upon a careful analysis of 90 unpublished cases. These cases embrace nearly all that have been treated at the New York Hospital during the last 15 years, and, in addition, a very valuable series of private cases which I owe to the courtesy of Dr. Weir and Dr. Bull.

Of these 90 cases, 68 had their origin in the soft parts, while the remaining 22 started in the bone or periosteum.

The subsequent history, which is so very important and at the same time so difficult to obtain, I succeeded in getting in 44.

Of these 26 were followed by fatal recurrence while 9 were living at the end of periods ranging from 3 to 10 years after last operation, and 4 others were alive, free from recurrence, 12 to 18 months after the operation.

Sex.—37 were female and 53 male.

Although I have gone over the literature of sarcoma very thoroughly, this is the only case of subperiosteal sarcoma of the metacarpal bone that I have been able to find reported.

Butlin, in his well-known work on "Operative Surgery of Malignant Disease," says, subperiosteal sarcomas may effect most of the bones of the body, but they are *very rare* in the short and irregular bones, and the only bones he mentions are the bones of the thigh, arm, forearm, clavicle, scapula and jaw.

Moulin, of London, in Treatise on Surgery that has just been published, says: "Periosteal sarcomas are more common in the femur than elsewhere, shaft or epiphysis, but there is no bone in the body that is exempt. They are *all* of them of the most intensely malignant character, so that if amputation is performed as soon as the diagnosis is made, the stump may remain healthy to the last, but secondary growths are almost sure to appear within the twelvemonth."

The classical paper of Dr. Samuel W. Gross, on "Sarcoma of the Long Bones," with an analysis of 165 cases, published in the *American Journal of Medical Sciences*, July, 1879, still remains the basis of our knowledge. Yet in the entire collection there is not a single case of sarcoma, either central or periosteal, of the metacarpal bones.

   (7 occured in the femur.
   46 " " tibia.
   21 " " humerus.
   13 " " fibula.
   7 " " ulna.
   6 " " radius.
   1 " " ulna and radius.

Of these cases 13 only were periosteal, of which but 4 were of the alveolar type. Of these 13 cases

   4 were found in the humerus.
   2 " " femur.
   1 was found in the ulna.
   1 " " tibia.

Ten occurred in males and 3 in females.

The average age of the patients in Dr. Gross' collection was $22\frac{1}{2}$ years, 5 years less than the average in central sarcoma.

The malignancy was much more marked, being 47% greater than in central sarcoma.

There seem to be little tendency to invade the joints or the bone itself, though in some instances the bone has been eroded, and the medullary cavity invaded.

While no single symptom or physical sign is pathognomonic, still there may be such a grouping of them as to form a clinical picture, highly suggestive of periosteal sarcoma.

The chief characteristic of subperiosteal sarcoma, derived

from a study of the cases of Gross and those collected by my-self, may be summarized as follows:

1. *A history of traumatism.* This was found in 7 of the 13 cases of Gross, and in 3 of the 5 in my collection.

2. *Early pain.* This precedes the tumor in over one-half of the cases, and usually remains throughout the course of the disease.

Both pain and traumatism are much more frequently found in the round-celled type than in the spindle-celled.

3. *Form of the tumor.* Usually fusiform and seldom encap-sulated, there being a strong tendency to early infiltrating the surrounding tissues.

4. Rapid increase in size, and discoloration of skin in later stages.

5. Slight elevation of temperature and pulse abnormally high.

6. Very little tendency to ulceration.

SUBSEQUENT HISTORY.

Gross was able to give the after history of 8 of the 13 cases.

Of these 2 died from the operation, 3 died of general dis-semination at the end of 7, 8 and 9 months after operation; 1 lived 32 months after operation and then died of metastasis, while a fifth had local recurrence at the end of 3 weeks. Of the remaining two, one was lost sight of at the end of 4 months, so only one of the eight was known to have been free from recurrence.

Of my 5 cases of round-celled sarcoma (periosteal), one of the femur is alive and well at present, 3 years after the opera-tion. A second of the femur is alive, 2 years after the opera-tion. A third of the scapula died of pyæmia, following ope-ration. A fourth, of the metacarpal bone (which I have just reported) had general recurrence in $4^1/_2$ weeks, which proved fatal 6 weeks later, while the fifth I was unable to trace.

The spindle celled type give a more favorable showing.

One of these, a periosteal sarcoma of the clavicle, is of such great interest, that it deserves more than a passing notice.

Butlin says the "disease appears to be very rare. Still more rare are the cases in which an attempt has been made to remove it." He reports two cases. Resection was performed in both. The patients were both young, and to this fact he ascribes the success of the operation. One was lost sight of and the other died shortly afterward from recurrence. Central sarcoma of the clavicle is almost as rare, as he was able to find but 3 cases reported. Resection was practiced in all of the cases. One patient was lost sight of; the second had a recurrence in 2 months. The third was the famous case of Dr. Valentine Mott, and the operation was performed in the year 1828. The clavicle was resected for a rapidly growing central tumor of 4 months' duration, in a patient, æt. 19. Although no microscopical examination was made, Butlin thinks there can be no reasonable doubt as to its sarcomatous nature. The patient died in 1883 at the age of 73.

The case in my collection was operated upon by Dr. Bull, in January, 1883, for sub-periosteal sarcoma of the clavicle. The patient was 33 years old, male, and both clavicles had been fractured in childhood. Six weeks previous to operation he began to have slight pain in the sternal end of left clavicle, followed two weeks later by a tumor. At the time of operation the tumor was one and a half inches in diameter, slightly nodular and firmly attached to the bone. The skin was not adherent and the tumor was not ténder. There were no enlarged glands. The clavicle was sawn through at the middle point and the sternal half removed. The patient made a good recovery, and is alive now, 1891, 8 years after the operation. (He has been confined in an asylum for a number of years for an obscure brain trouble.) The growth was a subperiosteal spindle-celled sarcoma.

Scapula. I have collected 3 cases of sarcoma of the scapula with excision of the entire bone. In one (referred to above) death resulted from pyæmia. The second died of shock, while the third, a periosteal spindle-celled sarcoma the size of an egg, which was operated upon by Dr. Bull, 1883, was alive and free from recurrence in January, 1891, 9 years after the operation. The entire scapula and an enlarged axillary gland were removed.

Poinsot's[1] table, published in 1885, contains the largest number of complete removals of the scapula. Of the 45 cases, 25 were for tumors, the malignant nature of which was either certain or probable. The mortality from the operation was 10%. Although 6 of the cases were tabulated as "cures," the time of observation is not stated, and Butlin considers it doubtful if more than one case can be claimed as actually cured. This case was alive and well 6 years after the operation.

Sarcoma of the Muscles.

Butlin, in the work already referred to, says that he has been able to collect from all sources over 20 cases of tumors of the muscles (sarcoma), and in every case recurrence followed operation, so that he regards the prognosis as bad as it well can be.

In my collection I have 8 cases of tumors of sarcoma of the muscles, and of these 4 were found in the triceps, one in the gastrocnemius and the others in the adductor muscles of the thigh. In one case, the sarcoma of the belly of the gastrocnemius, the tumor was the size of a small orange, and was supposed to be an aneurism until the operation. The growth was removed over 2 years ago, and the patient is free from recurrence at the present time. As recurrence in Butlin's cases was nearly always within the first year there is a good chance of this case proving a cure.

Breast. Seven of the cases were sarcoma of the breast, of which 2 occurred in the male. There was a history of injury in 2 cases, and 2 are now living, $2^1/^2$ and 2 years after operation.

Heredity. No clear evidence of heredity was found in any case.

In one case, a sarcoma of the neck in a woman, æt. 25, the growth recurred 4 times within 3 years, the last recurrence proving fatal. It is interesting to note that a child of this woman's died of sarcoma of the brain at the age of 3 years. Death occurred one year previous to death of mother.

[1]Rev. de Chirurg., v. 5, 201.

Treatment of Sarcoma.

While early operation gives a possibility of complete cure in a certain number of cases, the large proportion of cases in which fatal and often speedy recurrence follows operation, is sufficient to make the surgeon almost lose faith in his art in the treatment of this dread disease.

There are certain types of sarcoma that seem almost hopeless from the start, and when surgical skill, if called upon, only proves how utterly powerless it is. Is there nothing else that can be done to stay the progress of this disease? This is a question that has long occupied the attention of many of the best minds in the medical world, and at no time has it received as much thought as it does to-day.

Nature often gives us hints to her profoundest secrets, and it is possible that she has given us a hint which, if we will but follow, may lead us on to the solution of this difficult problem.

III. The Curative Effect of Erysipelas upon Malignant Disease.

That erysipelas has an influence upon malignant disease has long been recognized in a general way, but only recently has there been any scientific attempt to determine the nature and limits of that relation. The cases that could throw light upon this question until of late have been few and isolated, and, consequently, it has been impossible to draw absolute or far-reaching conclusions, but the evidence has been steadily accumulating.

Fehleisen's famous paper upon the etiology of erysipelas was published in 1883. His experiments upon dogs, and later upon a few cases in man, showed that it was possible to produce erysipelas by inoculating with pure cultures of the streptococcus erysipelatis. Fehleisen inoculated 7 patients with inoperable malignant disease, and of these 6 reacted. The seventh had suffered from erysipelas a short time before, and did not react. One was inoculated 3 times at intervals of two weeks, but reacted only after the first inoculation.

One case was a fibro-sarcoma of the cheek, with enlarged glands.

The superficial nodules disappeared and the enlarged glands diminished one-half.

The remaining cases were of carcinoma. One was a cancer of the breast which had recurred twice within two years. The patient was inoculated with erysipelas, and within one week the tumor had disappeared. There had been no recurrence at the date of publication of the article, six months later.

A third case was a cancer of the breast, the size of two fists and ulcerated. The axillary glands were enlarged. The enlarged glands disappeared and the main tumor was reduced in size one-half.

The remaining three cases showed but little change.

Bruns, in the *Beitrage f. klinische Chirurgie,* 1888, p. 443, has written an exhaustive article upon the subject, and his paper contains a detailed account of most of the cases up to that date. He discusses the effect of erysipelas, not only upon sarcoma and carcinoma, but also upon lupus, keloid and specific lesions. What chiefly concerns us are the cases of malignant disease. He has collected 14 cases of undoubted malignant disease, in which erysipelas occurred, either accidentally in the course of the disease, or was produced by inoculation. Of these 5 were sarcoma (diagnosis confirmed by the microscope) 3 were epithelioma, while 6 cases were either carcinoma or sarcoma.

Of the 5 cases of sarcoma 3 cases were *fully* and *permanently* cured.

The *first* was the case of (Busch) a multiple sarcoma of the head.

Second (Bruns) a *melanotic sarcoma* of the breast.

Of the two remaining cases (lympho-sarcoma of the neck) one was temporarily reduced in size, and the other had decreased one-half when the patient died in collapse.

To these 5 cases collected by Bruns I have been able to add 9 others (three recently inoculated by myself).

CASE I.—(Bull[2]). "*Round celled sarcoma of the neck, with* 5

[2]Unpublished.

recurrences within 3 *years. Erysipelas, Recovery.* The last operation was performed by Dr. W. T. Bull, Sept., 1884. The growth was found to be too extensive for complete removal. A large open wound, 5 inches long by 2 wide, remained and was soon filled by flabby sarcomatous granulations. Two weeks after the operation the patient had a severe attack of facial erysipelas, and shortly after the first a second attack. The granulations quickly disappeared, the wound rapidly cicatrized and the patient has been well and free from recurrences up to the present time, June, 1891. He was seen both by Dr. Bull and myself 7 years after the attack of erysipelas.

CASE 2.—(Winslow[3]). A middle-aged sailor with sarcoma of the neck, while being treated with injections of chloride of zinc developed erysipelas. The tumor *entirely* disappeared. One year later a sarcomatous growth appeared in the left breast.

CASE 3.—(Stein[4]). A woman, æt. 48, had a painful tumor of the breast. It was irregular, nodular, fixed to the chest wall, fluctuating in parts and not accompanied by enlarged glands. Clinical diagnosis, sarcoma. A severe attack of erysipelas accidentally followed a hypodermic puncture in the *dorsal* region. The attack lasted 12 days and at the end of that time the tumor in the breast had disappeared. No recurrence.

CASE 4.—(Kleeblatt[5]). Primary lympho-sarcoma of tonsil. Removal (by Czerny) was followed, a few months later, by recurrence in the neck. An accidental attack of erysipelas caused some improvement. Three months later an inoculation with Fehleisen's erysipelas cocci was made. At the end of 2 days a marked outbreak occurred. *Decided* temporary improvement followed, but death occurred 3 months later.

CASE 5.—(Kleeblatt). Lympho-sarcoma of the neck. Inoculation, pure culture. Erysipelas occurred 2 days later, followed by entire disappearance of the growth. No recurrence followed.

[3]London Medical Recorder, 1884, ii.
[4]Vratsch, 1882, No. 16, London Medical Recorder, 1883.
[5]Munchener Med. Woch., No. 7, 1890.

CASE 6.—(Fehleisen). Fibro-sarcoma of the face, with
enlarged glands. Erysipelas was produced by inoculation.
Marked temporary improvement followed and the tumor was
reduced in size one-half.

CASE 7.—(Coley). Sarcoma of the neck (spindle-celled).
Male, æt. 40, born in Italy. He was operated upon by Prof.
Durante, of Rome, 3 years before. Recurrence took place 2
years later, and in April, 1891, a second operation was per-
formed by Dr. Bull. The growth was too extensive for re-
moval and early in May he consented to inoculation. At the
time of inoculation the wound in the neck had not entirely
healed, and the cicatrix as well as the tissues along the upper
portion of right sterno-mastoid muscle were markedly indu-
rated. There was marked dullness at the apex of right lung
and the patient was troubled with a continual hacking cough.
There was a tumor in the right tonsil, the size of a small hen's
egg, and almost blocking up the pharynx. He could swallow
only liquids and these with great difficulty and they often re-
gurgitated through the nose.

In the presence of Dr. Attinelli and Dr. B. M. Bolton I in-
oculated him, May 3, with two different cultures, which had
been kindly furnished me, one by Dr. Harold Ernst, of the
Harvard Laboratory, and the other by Dr. Bolton. of the
Hoagland Laboratory of Brooklyn. One was a gelatin culture
which I used by scarifying and rubbing in the virus, and the other,
a beef tea culture which I introduced by means of a hypoder-
mic needle. I watched the patient very carefully, seeing him
2 or 3 times a day for several days following the operation.

Twenty-three hours[6] after the inoculation he had chilly sen-
sations, nausea, but no vomiting, headache and general ma-
laise. The temperature rose to $100\frac{1}{2}°$ and pulse to 100.
There was slight local redness. These local and constitutional
signs gradually disappeared, and at the end of 3 days his con-
dition was normal. I repeated the inoculation at intervals of
3 or 4 days, but got no very decided reaction until the fifth in-
oculation. I then used a larger amount of a fresh culture in

[6]In the German cases the reaction occurred at periods ranging from 16 to 61
hours, following inoculation.

beef tea prepared by Dr. Prudden and Dr. Cheeseman, of the College of Physicians and Surgeons, from material just obtained from Europe. The reaction was very well marked and appeared within 8 hours after the inoculation. He had a severe chill, intense pain in the head and vomited several times. The temperature rose to $101\frac{1}{2}°$ and pulse to 101. The larger portion of the fluid had been injected into the unhealed portion of the wound, but a few minims had been injected in several places in the normal skin and adjacent to the old cicatrix. There was intense local redness about each puncture, extending through a radius of one-half an inch.

The symptoms remained two or three days and then, together with the redness, slowly disappeared.

Five days later I did a sixth inoculation, using about the same amount of virus.

The reaction was again well marked, and the same signs and symptoms appeared and ran the same course.

June 2. One month following the first inoculation the tumor in the right tonsil had appreciably diminished in size. (It was growing very rapidly at the time of inoculation). His cough had entirely disappeared and he swallowed food with very much less difficulty, aud there was no longer any regurgitation. His general condition was excellent. From June 2 to June 24 the treatment was continued by Dr. E. T. Doubleday. Only one injection was made. His condition was then about the same.

CASE VIII.—(Coley). *Round-celled sarcoma of the lower end of the femur (periosteal); Inoculation with erysipelas (pure culture); Marked temporary improvement.* M. B., æt. 16, female. Six months ago, without apparent cause, the knee began to swell and became slightly painful. The swelling gradually increased and motion became somewhat limited.

She was examined at several dispensaries and the nature of the disease was thought to be tubercular. She was sent to the New York Hospital for excision of the knee.

An exploratory incision was made by Dr. Weir and a portion of tissue was removed and examined by the pathologist. It was found to be a round-celled sarcoma. The whole lower end of the femur was enlarged, but the enlargement was con-

fined chiefly to the outer condyle. It had apparently started in the periosteum, but had invaded the medullary cavity. It was too extensive for removal, and as the patient's general condition was bad (temperature 99°-102°, pulse 120), it was thought doubtful if she could stand the shock of an amputation.

The middle of May, two weeks after the operation, she was taken to her home and put under my care in order to have the erysipelas inoculation tried.

At the first inoculation I used a small quantity of virus. I tried three different methods, scarification, injection and putting a little of the fluid culture upon the granulating surface.

A slight reaction followed, beginning eighteen hours after the inoculation. The temperature rose to 103° and pulse to 120, but there was no distinct chill. There was slight nausea, but no vomiting.

Three days later the reaction had entirely subsided, and I did a second inoculation. I injected the fluid culture into the tumor substance. I used a larger amount. Severe reaction followed. Nausea and vomiting with a severe chill began about fourteen hours after the injection. The temperature rose to 104.5° and the pulse to 140. The reaction took somewhat longer to subside than the previous one, but in four or five days it had entirely disappeared. The sloughing granulations where I had first put the virus had begun to rapidly clear off leaving a bright granulating surface.

The third inoculation I did June 1 into the tumor substance. This time I used ℥ xx of beef tea culture, about the same quantity that I had used at the last inoculation. The reaction, instead of being less severe, was very much more marked. Within one-half hour after the inoculation she had a severe chill and violent vomiting, and the pulse became very rapid and weak. She was given brandy and water. Her temperature rose to nearly 105°. The reaction subsided in the same way as it had done before. The granulations continued to clear up and become more healthy, and her general condition remained about the same.

At the time the inoculations were begun the lower end of the right femur was about the size of a child's head. The old incision, six inches long, was widely gaping and a long sarco-

FIG. II.—DR. COLEY'S CASE OF SARCOMA OF LOWER END OF FEMUR.
PORTION SHOWING GRANULATING SURFACES PRODUCED BY
THE ERYSIPELAS CULTURE.

matous mass the size of two fists projected from the wound.
There was a sinus large enough to admit the finger extending
into the interior of the bone. There were no enlarged glands
in groin. (Fig. 2).

During the first three weeks of June the treatment was con-
tinued (in my absence) by Dr. Samuel J. Milliken. Two more
inoculations were made with smaller amounts. A good reac-
tion followed in each case. The improvement in the lower
portion of the tumor was marked, but her condition was so
weak that she could stand only a small amount of the virus,
and as the tumor was apparently increasing in size in the cen-
tral and deeper portion, I decided to suspend further inocu-
lations.

In both cases the antagonistic effect was well marked, and
improvement, even if temporary, was sufficient to make me
believe that, had the cases been less far advanced when the
treatment was begun, it would not have been too much to
have looked for a permanent cure. The fact that in one of
the reported cases when two attacks of erysipelas had acci-
dentally occurred, the first diminishing the size of the tumor,
and the second causing it to disappear, led me to try *repeated*
inoculations. I think that the *danger* which is by some urged
against inoculation, can almost entirely be eliminated by be-
ginning with small doses and repeating them. The amount to
be used, of course, depends upon the condition and strength
of the patient. What produced but a moderate amount of re-
action in one case would doubtless have caused a fatal result
in the other.

Just how this influence is exerted is at present undetermined.
The theories that have the greatest support are (1), that the
erysipelas coccus has a *direct destructive* action upon the cell
elements of the new growth; (2), that the *high temperature*
alone is sufficient to destroy the cells of lower vitality causing
a fatty degeneration followed by subsequent re-absorption;
(3), that sarcoma and carcinoma are both of bacterial origin
and the erysipelas germ has a direct antagonistic effect upon
the cancer bacillus.

Bruns does not think that any one of these theories is suf-
ficient to account for the phenomena in the different cases, and

it seems in the light of the present knowledge not improbable that all of the three theories may contain an element of truth, and that a larger theory combining all these elements is necessary to explain the curative action of erysipelas.

That high temperature alone is a factor, and by no means an insignificant factor, numerous observations are cited where tumors both malignant and benign have shown marked diminution in size during an attack of the various infectious diseases, *e. g.*, scarlet fever, typhus, cholera, etc., and the same is true of pyæmia. It is possible to attribute the result even here to antagonistic bacterial action, and in every one of these examples the high temperature is due to bacterial infection, it seems to me much more rational to suppose that the curative effect on the new growth is dependent upon the same infection than upon what apparently is only a coincident, but unimportant result of the same cause.

In the cases which I have collected, there is one which bears upon this question. The patient, a male, æt. 35, was operated upon by Dr. W. T. Bull, in 1888, for large periosteal, round-celled sarcoma of the lower third of the femur, with secondary deposits in the center of the bone. Amputation of the thigh at middle and upper thirds was performed.

The second week after operation the patient had a very severe attack of pyæmia (possibly phlegmonous erysipelas) with multiple abscesses in various parts of the body. The temperature ranged from $104°$-$105°$.

The patient has had no recurrence and is now living, nearly three years after the operation. Of course this is not to be regarded as absolute evidence that the attack of pyæmia had any influence in preventing a recurrence, but when we consider the highly malignant nature of the tumor and remember how few do not recur, there still remains a reasonable degree of probability that such influence existed.

Appendix, August 7, 1891.

While the above was in the hands of the publishers, the inoculations were kept up at short intervals in my cases of sarcoma of the neck and tonsils. The result has been very

marked, with continued improvement. The tonsil tumor is much smaller, and the nodules in the neck have nearly disappeared. His voice has very much improved, and his general condition is decidedly better. He has now had sixteen inoculations; reaction still takes place, though less marked than at first.

I will add a few brief notes of a third case which I have inoculated during the past two weeks:

The patient, a woman (young adult), received a slight injury to the back one and a half years ago. A short time afterward she began to have pains in the breast. Later, a small swelling appeared over the spine in the upper dorsal region; this grew slowly, and was slightly painful. The tumor was removed by Dr. Bull the latter part of April, 1891. It was so closely attached to the spinous process of two of the upper dorsal vertebræ, that the processes were removed at the operation. Examination showed the growth to be a round-celled sarcoma. Recurrence followed one month later, and in June a second operation was performed.

A second recurrence quickly followed, and the last of July I began inoculations with a pure culture of erysipelas, prepared by Dr. B. M. Bolton. The first two injections were subcutaneous, and only a small amount ($\mathfrak{m}$xv) was used. There were no constitutional signs, and only very slight redness of the skin. The third inoculation I used $\mathfrak{m}$xlv, and injected deep into the tumor-substance in two places. In two hours she had a severe chill, and the temperature rose to 103°. She also had several attacks of vomiting, with headache and general malaise.

At the end of two days her condition was normal. There was scarcely any local redness at any time. The tumor was much more movable and perceptibly smaller. The following week two more injections were given, but the reaction was slight, and there was no apparent effect on the tumor. The last injection ($\mathfrak{m}$l) caused a slight chill, and temperature of 101°. The tumor was evidently again increasing in size; inoculation was discontinued, and a third operation performed two days after last inoculation. The tumor is now undergoing a careful microscopic examination by Dr. Bolton.

These last two are the only cases of periosteal origin in which erysipelas has been tried, and apparently this variety is less susceptible to its influence.

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I. REPORT OF A CASE OF SUBCLAVIAN ANEURISM, WITH LIGATION OF THE SUBCLAVIAN—CURE.

II. REPORT OF A CASE OF NEPHRORRAPHY.

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IN reporting this case, I shall not attempt to make comments upon it, but do so to swell the statistics showing the wonderful advantages of antiseptic surgery over the non-antiseptic.

Robert S , æt. 60, colored, male, widower; by trade a blacksmith.

About two years ago, while still at the blacksmithing trade, he noticed a swelling above the right sterno clavicular articulation, attended with pain. It was pulsatile and increased when the arm was used. He was seen by a physician, who gave him a liniment which did a little temporary good.

The swelling and pain increased, the pain radiating over the right side of the head, and down the right shoulder and arm; some difficulty in swallowing and a cough, which gives more or less pain, and which causes the tumor to rise high in the neck

Upon February 16, 1889, the first time I saw him, his vision had failed, until there was practically amaurosis, though the left eye is able to distinguish shadows and lights. The right pupil was more contracted than the left. Ophthalmic examination revealed an atrophy of the optic nerve, with retinitis pigmentosa. True aneurismal bruit and slight impulse over the upper right chest walls. The tumor was about three inches long and two inches in diameter, extending below the sterno-clavicular articulation. Pulsation in the right radial artery slightly impaired in quality. The right carotid seems normal.

The diagnosis was made of aneurism of the first part of the right subclavian, involving the innominate.

I operated upon February 21, assisted by Drs. Watson, Fletcher, Cheesebrough and Jordan The usual incision was made for ligation of the subclavian in the third part. The external jugular vein crossed the line of the incision almost in the middle, being the size of the little finger there. It was dissected out and held to the inner side of the incision by retractors. The brachial plexus was exposed, and it was remarked how much some of its cords resembled the artery, except for the longitudinal striation of the nerve and the circular striation of the elastic fibres of the artery. The artery was quite deep, but was dissected out.

Catgut was used to ligate the artery, with light catgut for the sutures. There was not half a teaspoonful of blood lost, not enough to discolor the water in the first and only basin used. Iodoform and iodoform gauze used as dressing. Time of operation 30 minutes. Chloroform was used as the anæsthetic, and patient came from under it in half an hour.

February 22. No rise of temperature; pulse 80. Patient had slept well and said he was feeling all right.

February 24 From ignorance the patient had removed most of the dressing to get at the wound to scratch it, as he said he could not stand the itching. When completely removed, the incision was found completely united, no suppuration or discharge. Improvement in all the subjective symptoms, though the pulsation is not materially affected. Tumor seems to be more firm and solid.

March 4. Still complains of some pain in shoulder. Slight pains in chest walls from probable wound of a thoracic branch of the brachial plexus. No cough. Pulsation in the right carotid much exaggerated. No bruit or thrill over tumor. Slight enlargement of the right carotid.

March 20. Patient almost entirely relieved from pain, and, in fact, all subjective symptoms. The tumor is hard and firm, and is becoming smaller every day.

Patient says his eyesight is improving, but no reliance is placed upon this statement.

April 13, 1889. Aneurism decreased in size; no pain in shoulder.

April 21, 1890. Aneurism size of walnut. Hard and firm, and no disturbance felt from it.

At present writing the tumor is still decreasing in size.

Pulsation returned in the right radial three days after the operation.

History of syphilis or of hereditary influences were not obtained, though the former was probable.

II Female. æt. 44. For the last six or seven years she has noticed a lump in her side, which she attributed to some uterine disturbance, as about the time she noticed it first she had an abortion. It grew slowly, and after lifting or straining she would be seized with violent colic, caused probably by twisting of the pedicle, which would last two or three days. She would then feel it turn over and then the pain would gradually subside. During these times of colic almost total suppression of the urine would occur. Her general health was good, but during the attacks of colic she would suffer intense pain.

Upon examination the tumor was found to be slightly larger than the normal kidney, low in the left abdominal cavity, simulating an ovarian tumor. No particular disturbance of menstrual function. Examination per vaginam revealed nothing relating to tumor except to show that it was not attached to uterus nor to the appendages. The urine was tested, but showed nothing abnormal. Palpation revealed but little owing to thick abdominal walls and large lumbar muscles. Operation was determined upon Sept. 16, 1890. Operation was performed at Mission Hospital, chloroform being used as an anæsthetic The nature of the tumor not being certain, a median abdominal incision was made, 3 inches in length. Upon examination through the incision the tumor was found to be the left kidney enlarged and floating freely. It had been the intention to remove the kidney entirely, but no kidney was found upon the right side. The right renal artery seemed to be absent, while the left was enlarged one-half. Nephrorraphy was then determined upon. Owing to the thickness of the walls of the abdomen and its depth, a suture could not be passed through the abdominal incision. The usual lumbar incision was made just anterior to the Quadratus Lumborum muscle. The kidney was reached without much difficulty, but from fear of interference with its function the suture was passed only through the fatty tissue surrounding the organ. A silk suture was thus passed, with the assistance of a hand through the abdominal incision, suturing the kidney to the Quadratus Lumborum. Practically no blood was lost. Catgut was used for suturing the incision, and an iodoform dressing applied. Patient rallied nicely. Considerable pain complained of in region of lumbar suture, but this subsided on seventh day. Upon this day the dressings were removed and union was found perfect No suppuration. Patient's urine was a little ropy and very scanty on the second and fourth days

after the operation, but soon cleared up. She was allowed to get out of bed on the sixteenth day. No tumor could be felt at this time. Patient had no trouble from pain and no colic for two months:

About Dec. 15, while acting as nurse in Hospital, she did some lifting which was followed in two or three days by a dragging pain in left side. This increased in spite of pads, etc., until the kidney descended two or three inches from its place. There it has stayed since. It does not move freely and she has no colic from twisting. and recently has had no troubled from it. Urine normal. A second operation could hardly be done, as, if the suture were to be passed through the substance of the kidney, there being but one organ, interference with its function might be so great as to result fatally.

THE MÜTTER LECTURES ON SELECTED TOPICS IN SURGICAL PATHOLOGY.

SERIES OF 1890-1.[1]

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LECTURE VII.

SURGICAL DISEASES OF MICROBIC ORIGIN.

SYLLABUS.—*Actinomycosis:* History. Description of the disease, and of the fungus. Actinomycosis in man. Paths of infection.

Anthrax: History. Sources of infection. Bacillus anthracis; its characteristics; intensification and diminution of its virulence.

Malignant Œdema: Gangrenous emphysema. Description of the disease. Anatomical characteristics. Description of its bacillus; biological peculiarities. Immunity enjoyed by certain animals.

Rauschbrand: Symptomatic anthrax. Strong resemblance to malignant œdema; essential differences. Description of its bacilli.

Glanders or Farcy: Brief reference to its infectious organism; the bacillus mallei. Difficulties of diagnosis.

ACTINOMYCOSIS.

UNDER one name or another the peculiar manifestations now known to be the result of the condition termed actinomycosis have been recognized in nearly all civilized countries, and have been noticed especially about the head and neck of domestic animals, particularly cattle. The large variety of names given to these lesions constitutes the best

[1] Delivered before the College of Physicians, Philadelphia, December, 1890.

indication of the fact that their etiology was unknown. During the past thirty or forty years they have been more and more carefully studied by veterinarians. In England, for instance, as early as 1833 a peculiar swelling met with in cattle, and known locally as *clyers*, had been somewhat carefully studied by Professor Dick. He dissected several animals which presented these tumors in the parts about the throat, and described them as having a somewhat malignant character, and corresponding to what were usually called "medullary carcinomatous tumors." He noticed also that sometimes abscesses developed, and that when these were laid open healing frequently followed, and that in other cases the open sores remained indolent for a time and then increased until they interrupted respiration by their bulk, and prevented deglutition. In 1841 he made a further report on the same subject, describing now the mouth and throat of a cow in which there was a distinctive tumor, and he spoke of it as a mass of fungus flesh, while a part of the jaw was decayed and absorbed. This time he stated that the disease was not unknown in cattle and that it was well-known as attacking the jaws in human beings; that by surgeons it was denominated osteo-sarcoma of the maxillary bones, and he added that the remote cause seemed to be a scrofulous diathesis, while the existing cause was commonly disease of the molar teeth, or some accidental injury. In 1843 a Mr. Relph described in *The Veterinarian* a "kind of indurated tumor" which he met with in his practice oftener than anything except the common wens. He spoke also of its ulceration and extension until at length animals sank and died of "atrophy or phthisis pulmonarius." He spoke also of a section of one of these tumors as "mostly displaying several abscesses with matter varying in consistency, and often very fetid, enclosed in what seemed to be fibro-cartilaginous cysts." Also, again, of the implication of the nasal sinuses and involvement of the orbital cavity, where bone was being removed and matter deposited, and also that the tongue was much enlarged and ulcerated. In 1845 Professor Simmonds spoke of the diseased condition as an affection termed *scirrhus tongue*, and one frequently found associated with maladies essentially different. Under this term, scirrhus tongue, it was com-

monly described until quite recently. In 1864 a case was fully described in the *Ed. Vet. Rev.* under the title of "Cancer of the Tongue in an Ox." On the continent also this disease had been everywhere misunderstood. It had been frequently regarded as a tubercular infection or mistaken for a simple chronic glossitis; while the continental languages were full of common names for it, and veterinarians spoke of it as osteo-sarcoma, bone cancer, spina ventosa, etc. In 1876 Bollinger presented to the Society for Morphology and Philosophy at Munich a learned paper on the subject, with a demonstration of microscopical and gross specimens. He pointed out that these tumors consisted of several centres of growth bound to-gether by connective tissue, whose cut surfaces presented yel-lowish white suppurative foci, or at times a spongy texture, owing to the formation of minute cavities in a fibrinous crust, which contained a thick, yellow, caseous pulp. The micro-scope revealed a structure something like that of sarcoma, while the expressed juice contained, among other materials, small granular bodies which had a mulberry like appearance, and were sometimes encrusted with chalky matter. He had discovered that these latter bodies were true fungi, and he further maintained from the constancy of their appearance and they were not accidental but had a pathological signifi-cance. These also he had met with in old museum specimens.

Bollinger had observed this remarkable formation not only in the upper and lower jaws, but also in the tongue, in which latter organ, when recent, it much resembled the condition produced by tuberculosis. If these nodules were situated on the surface of the tongue they rapidly led to the formation of ulcers. It was possible also for an interstitial glossitis to oc-cur, which, in spite of partial atrophy of muscle fibres, led to enlargement and peculiar hardness of the tongue, from which the infection gained, in German, its popular name *holz-zunge*, or wooden-tongue. On continuing his researches further, he discovered the same fungus in tumors which occurred in the pharynx, larynx and stomach. He even described this fungus in a case of so-called fibroid of the second stomach of a cow, and in a form of apparent tubercular ulceration of the intes-tines. He submitted the fungus to the botanist Harz, who de-

scribed it and assigned it to a temporary position. Cultiva-
tion experiments and inoculation of the tongue of a calf with
liquid containing the organism, all failed. Its name was given
by Harz. Bollinger's paper was published in 1877 and attracted
wide-spread attention, and brought out the claim from Per-
roncito and Rivolta that they had already discovered the same
organism in 1863 and 1868 respectively. It is very probable
that Hahn, of Munich, met with the fungus in 1870, since he
states that in a case of wooden-tongue he found characteristic
structures, which he described provisionally as a species of
mould fungus, but Bollinger was certainly the first to study the
organism systematically, and to throw an entirely new light
upon the pathology of the infection, and his researches were
corroborated by Siedamgrotzky, by Johne and by Ponfick; and
so by one observer and another on the continent, and later in
Great Britain, the pathological identity of the various lesions in-
cluded under so many different names was established, and
the names of Boström and Israel, of Axe and Crookshank, and
of many others in addition to those already named, have be-
come inseparable from the subject itself. During the year
1858 a most important memoir was sent to the agricultural de-
partment of the Privy Council by Professor Crookshank, of
King's College, which was published in the annual report of
that department for that year. It is a most elaborate docu-
ment, extensively illustrated, and prepared with the greatest
care, and to it the writer is largely indebted. One of the
things for which we are especially indebted to Professor
Crookshank in this matter is the establishment of the fact that
many of the lesions in animals which had before been consid-
ered due to tuberculosis, are in reality manifestations of acti-
nomycotic disease, a beautiful proof of which that gentleman
has kindly afforded me in his own laboratory, while in the
document referred to it is amply evidenced by illustration.
Altogether we regard this report pertaining to animals and
men as well, and comprising 80 pages, as presenting perhaps
the best summary of the subject which we have.

The disease, as Crookshank and others succinctly state, be-
longs to the class of infective granulomata. It has an irrita-
tive, inflammatory action, brought about by the presence of a

special irritant, a microphyte, and consists of a collection of round, epitheloid, lymphoid and giant cells, enclosed within a fibrous reticulum. There are thus constituted nodular tumors of various sizes. Sometimes these attain large dimensions, at other times they break down early and suppurate. While it appears, as seen in a former lecture, that the actinomycotic fungus may by itself produce pus, it is nevertheless equally true that suppuration in actinomycotic tumors is commonly due to a secondary infection by the ordinary pyogenic organisms. Calcification takes place sometimes in the fungus tufts, and altogether the actinomycotic nodule so closely resembles the tubercular in its minute character that it constitutes almost a mimicry of the latter. Its most characteristic manifestation in cattle is betokened by the popular name most frequently given to it, namely, *lumpy jaw*. It is especially prevalent in river valleys and marshes, and on land reclaimed from the sea, and in animals appears to occur more frequently in the winter, and more often in the young than in the old. There is strong reason for believing that the fungus gains access to the system through wounds or ulceration of the mucous membrane, or through carious tissue. It has been pointed out that the common occurrence of the disease at the time of second dentition may be due to the wounds produced during the shedding of the teeth. It is supposed, also, that thistles and frozen roots, by wounding the parts, may afford a path of entrance. Discharges from infected animals are thus infectious, and cow sheds and pastures, drinking troughs and fodder may be easily contaminated.

The fungus itself may be detected with the naked eye in the discharge of an actinomycotic ulcer, or in the scraping from a cut surface or growth. Its tufts vary in size from that of a grain of sand to that of a pin's head. If the material contained be spread out on a slide and examined against a dark back-ground, these granules appear white or yellow-white in color, but if examined in transmitted light they appear distinctly brownish. If they are pressed down with a cover-glass they readily flatten out, while possibly a distinct gritty sensation is transmitted to the finger, owing to the presence of calcareous matter. With a low power the fungus will be recog-

nized in the form of irregular patches scattered over the field, which might at first be mistaken for granular debris, but which on more exact examination will be observed to have a characteristic appearance. With a higher power masses will be seen which look like a rosette of clubs, or which have here and there throughout the margin a club-shaped projection. Of course with these bodies, pus cells and other granules will be found. By pressing upon the cover the rosette is broken up and then the club forms are recognized singly or in twos, or in the shape of fan-shaped segments. The presence of calcium salts may be readily demonstrated by the acids which dissolve them; by which the clubs are not affected. The club-shaped masses are not affected by ether, nor by potassium hydrate, which shows that they are not fat crystals. By teasing the little cluster we may break it up into its club like elements, and these may be examined with still higher powers. When these grains are placed in water and teased out, the center portion seems to be composed of a structureless core. When the organism is removed from the disease in man, it appears to present minute and delicate filaments which are not present in those removed from animals.

Actinomyces were generally regarded as belonging to the higher micro-fungi until Boström put forward a new theory. By Harz and Johne the club-shaped prolongations were considered to be conidia and the threads to be hyphæ. Boström on the other hand thought that the clubs should not be regarded as conidia, but the result of a pathological stage of the threads, and he considered that the calcification which occurs in them supports his view. If this were the case, cultivations could not be successfully made from the clubs, but must be made from fungi containing threads. He made cultures from five animal cases and one human, and obtained a similar result from all. The fungi were isolated from pus with sterilized needles, were placed in liquified gelatine, in which they were teased out, and the gelatine then spread on glass plates. In a few days the growth became visible. The fungi were then isolated from the plates, crushed between sterilized glass slides, and planted on the surface of nutrient agar and blood serum. In this way pure cultivations were obtained, and the culture

which I show you herewith is made from a descendant of one
of his original cultures.   It grows in a peculiar way, with a
finely granular whitish appearance; after a few days small yel-
lowish red spots appear in the center, increase in size for a
week or so, and then become confluent, while the margin is
also dotted with similar spots.   Isolated colonies as they ap-
pear have a yellowish red center with a grayish margin.   Bos-
tröm states that the actinomycis is not one of the mould fungi,
and its central threads do not constitute a mycelium.   He was
inclined to regard it as a branched cladothrix.

Johne and Ponfick made a careful series of experiments to
prove that actinomycosis is transmissible from animal to ani-
mal.   Inoculation experiments, whether subcutaneous or intra-
peritoneal, as well as intra-veinous injection, were successful.
Feeding experiments gave negative results.   It appears from
their researches that rabbits and dogs possess a marked im-
munity, while the cow is, perhaps, the most susceptible of all
animals.

We are naturally most interested in this disease as it ap-
pears in man.   In 1878 Israel published the drawings made in
1845 by Langenbeck, then in Kiel, of a case of vertebral
caries, in the pus from which peculiar bodies were observed.
There can be but little doubt that these structures were the
fungi of actinomycosis.   But the first published observations
will be found in Lebert's large work on pathological anatomy,
described in the text and figured in the atlas.   In 1848 Lebert
received some pus of great consistency which had been ob-
tained from an abscess in the thoracic wall in an elderly man.
The patient had been thought to have a cancerous pulmonary
affection.   The pus contained a very considerable quantity of
minute spherical beads, which could be crushed between two
strips of glass, and in which, under a low power, radiating
wedge-shaped bodies were found.   Lebert tested these bodies
most carefully with chemical reagents, and had in mind the
possible existence of some helminthic débris of which these
bodies might be hooklets, but he sought in vain for the com-
mon parasites.   Actinomycotic pus was later described and
figured by Robin, but the first adequate description of the dis-
ease in man was made by Israel, who was soon followed by

Ponfick. By these two writers the various cases which had been observed up to that date were collected and described and the disease classified according to the seat of invasion. Up to the time of Crookshank's report he had collected about one hundred and thirty human cases, and from those as well as from the work of Israel, the following description is largely drawn.

Invasion by the mouth and pharynx.—The fungus may gain access through carious teeth or wounds or fistulæ of the jaw, and possibly by the pharynx and tonsils; it attacks the lower jaw most frequently. The consequent tumor is found in close connection with the bone, and just beneath the jaw or in front of the trachea. Actinomycotic tumors in this region appear to correspond very closely with the *clyers* already described in cattle. As in cattle, they may discharge through the skin, although they differ in their tendency to form burrowing abscesses instead of recognizable tumors. The upper jaw is much less frequently attacked than the lower. The progress of the disease is usually slow, and there is a tendency to the deep seated parts becoming involved; while when the lower jaw is attacked the tumors tend to approach the surface. In other cases the disease has been described as extending from the alveolar process to the temporal bone or the base of the skull, destroying these bones and even reaching the brain. In yet other cases, it has extended along the spinal column, implicating the vertebræ and traveling and pointing in various directions. The first cases of actinomycosis hominis which were observed in this country were connected with the jaw, and were described by Dr. Murphy, of Chicago. Both recovered after thorough curetting. In one recorded case the disease existed for seven years, was localized in the bronchi (bronchitis actinomycotica) and did not extend into the lungs. The sputum was examined and contained the characteristic fungus. If the fungi be inhaled they pass into the lungs and produce proliferation of round cells, which undergo fatty degeneration. The resulting patches of peri-bronchitis or pneumonia become yellowish white. Suppuration and hæmorrhage follow, and the resulting small cavities contain pus cells, fat granules, blood and fungi; ultimately a dense layer of con-

nective tissue is formed around the cavities, which are lined with granulation tissue containing the characteristic fungus. The symptoms are usually obscure, but the specific organism may be found in the sputum, and is in fact often recognizable with the naked eye. The apices of the lungs are not, as a rule, affected. There is considerable resemblance in clinical course to chronic or fibroid phthisis. In the second stage the symptoms are more severe. The disease spreads to neighboring parts and often pleurisy supervenes. The disease has been known to descend behind the diaphragm and point as a psoas or lumbar abscess; or to perforate the diaphragm, reach the abdominal cavity, and there set up peritonitis or sub-phrenic abscess. The disease may also extend forward in the direction of the pericardium and anterior mediastinum. In the third stage the disease comes to the surface, either over the chest or in the neighborhood of the vertebræ; a livid swelling appears from which no fluid escapes on puncture, but which works its way to the surface, and then discharges the muco-purulent fluid, in which the fungi are easily recognized.

Invasion by the digestive tract.—Chiari has published a case dying from general marasmus, after two years' illness, at the age of 34. The mucous membrane of the intestines was completely covered with whitish patches closely adherent to the adjacent tissues. In this case the teeth were carious. In such cases generally small nodules about the size of a pea may be found in the sub-mucous tissue and in the mucosa itself, they soften and form ulcers with determined edges, their bases reaching the deepest layer. These may undergo cicatrization, but generally ulceration extends through the peritoneum to the abdominal cavity, and we have perforation of the bladder or the intestines, or perhaps of the abdominal wall. Symptoms are absent or not characteristic. The fungus may be found in the evacuations or by exploratory puncture.

Besides such cases as the above, which can be easily classified, there are a number of recorded cases presenting varied symptoms and anatomical relations in which the path of infection has not been determined. It may be said in common of all cases, however, that no matter where the lesions may be

situated, the discharges therefrom present always typical characteristics.

The first case of actinomycosis in man met with in Great Britain was described by Dr. Harley in 1885, the patient being an inmate of St. Thomas Hospital. The next two cases were recognized by Mr. Shattock, who published them in the "Pathological Transactions" in 1884 and 1885. Numerous other cases are described in English journals, and it is a matter of interest to know that numerous specimens which had long been deposited in museums, that of the College of Surgeons, for instance, and had been described under other names, were found to be genuine cases of actinomycosis. It is worth while also to know that since the introduction of Gram's method of staining, a distinctive advance in the recognition of the organism has been made, since by this method, combined with staining by orange rubin, as pointed out by Crookshank, the threads are stained blue and the clubs crimson, while in the younger clubs the protoplasm of the thread can be traced into their interior. Evidently, then, the best method of preparation is Gram's stain followed by eosin or orange rubin. Inasmuch as Gram's method had not been applied by either Israel or Koch in the earlier part of their studies of this disease, it is not strange that most of their writings have failed in the complete description of the organism which the later reporters have given.

So far as the source of the disease in man is known, many interesting observations have been made. Two cases have been recorded in support of a theory of direct infection from the cow. One of these occurred in a man who had the care of animals, some of which were diseased, the other in a man who had charge of cows, one of which had a tumor of the jaw, which tumor he had opened. On the other hand Moosbrugger found that out of seventy-five cases, fifty-four were in men, nineteen in women and two in young girls. In eleven of these the occupation was not stated, in thirty-three their occupations did not bring them into contact with diseased animals. Only ten of his cases occurred among farmers, peasants and farm laborers, and only one of these ten had been brought into contact with diseased animals. Of the twenty-one women there

were only four peasants and none of them had been taking care of diseased animals. Infection by the flesh of diseased animals has also been discussed, but there is no evidence of prevalence of the disease among butchers, who would be particularly liable to it if flesh were a source of infection. Moreover the chances of infection from this source are minimized by the flesh being almost always cooked. To be sure the disease occurs also in pigs, and pork is often eaten in an uncooked state; and Israel has pointed out that the disease has never been known to occur among strict Jews. Evidence seems to point to the origin of the disease among the cereal foods. This view is supported by observations with reference to the part played by cereals in inducing the disease in cattle, an origin well known, and it gains additional support from a case described by Soltman where the disease resulted from swallowing an awn of barley. This was accidentally swallowed by a boy of 11, who became very ill and suffered great pain behind the sternum extending to the back. An abscess formed, covering an area extending over this inter-costal space, and when opened the awn of barley was found in the evacuated pus, but pain continued and fresh deposits occurred, and when the boy was taken to the hospital, the specific fungus was detected.

As Crookshank states, it has not been possible to trace every step in the life history of many of the basidiomycetes; but if we regard the ray fungus in the light of what is known to occur in many species, this life history may be explained about as he explains it, thus: The spores sprout into hyphæ, and these form fine threads which branch irregularly and sometimes dichotomously; the extremities of the branches develope the club-shaped bodies; these are so closely packed together that a more or less globular body is formed with a central core composed of a dense mycelium. By Gram's method, these threads can be differentiated into an external sheath with protoplasmic contents. The club-shaped body appears to be externally mucilaginous, while internally it is continuous with the protoplasm of the thread. In all probability the clubs represent organisms of fructification. If this be correct the protoplasm in the interior of the club may possibly undergo changes leading to spore formation, the spores being ultimate-

ly set free. At other times the clubs themselves seem to
sprout, and the sprouting forms to suggest teleuto-spores.   In
whatever way formed, there is but little doubt that spores are
set free in the vicinity of a rosette, and give rise to fresh in-
dividuals, and that spores and young fungi are taken up by
wandering cells, by which they are conveyed to a distance
where they reproduce their kind.

At the Congress of German Surgeons in 1890, Israel and Wolff made an important
communication on ray fungi, and their successful cultivation outside of the animal
organism, and their successful implantation of such cultures upon the animal. In
this a claim was made that they were the first to succeed in cultivating the actinomy-
cosis and implanting it, which claim would appear to be unjustifiable, since, so far
as I can learn, Boström anticipated them in this work by several years. Still their
remarks and their demonstrations were most entertaining, and the question of priority
is one of minor importance. That they did succeed is established, and the fact that
it is possible to produce an artificial actinomycotic disease in animals is established
beyond a doubt.

ANTHRAX.

This goes also by the name of *milzbrand* in German, *charbon* in
French, and is known in common parlance as *malignant pustule*,
woolsorter's disease, and often as *carbuncle*. The latter, term how-
ever, is unfortunate and is liable to misuse. The common
carbuncle is simply a phlegmonous process accompanied with a
large amount of tissue necrosis, produced probably by common
pyogenic or perhaps saprogenic forms, and although I have once
found in the blood taken from a large typical carbuncle of this
character, on the back of the neck, bacilli much resembling in
form and appearance those of true anthrax, I regard their pres-
ence there as accidental and do not think that I had to deal with
any specific form.   On the other hand the malignant pustule of
animals has about it much that reminds one of carbuncle in
man.   In animals the disease has been known for centuries,
although it remained for observers who are still living to
demonstrate the specific organism by which it produces con-
tagion.   Various descriptions of the disease in man occurred
during the latter part of the previous century, and its primary
existence in man was apparently first claimed by Boyle in 1800.

Of the specific bacillus which is the prime cause of this disease it is hardly necessary to speak, except to remind you of its peculiar resistibility to influences which are destructive to most micro-organisms, and of the little trouble with which it can be utilized in the laboratory because it is so easily cultivated, so readily inoculated and because of the ease with which it can be demonstrated in the circulation and the tissues. In scarcely any organism can the development of spores be better watched, and except for the dangers attending carelessness in handling, it is a most satisfactory organism with which to work. There is this peculiarity attending it, that in the bodies of living animals these organisms multiply solely by segmentation, never producing spores while their host is still alive. Their spores are produced only in dead media, with favoring temperature, whose limits are 15 and 45C. According to Koch, the disease spreads among animals by germinating spores which cling to grasses and plants in moist localities, and which are taken in with the food and cause the intestines to become the first seat of infection.

When the disease occurs in man it is almost invariably contracted from the carcass of some infected animal, or the products of the same. The term wool sorter's disease is most significant, as showing, perhaps, the most common source of contagion. So long as the skin remains intact it is protected; the slightest abrasion may serve as port of entry for the germs; even the mucous membranes may be infected either by bacilli or their spores. It is said that these latter are so minute that they may reach the circulation through a healthy mucous membrane; and the disease is often conveyed by the bites of mosquitoes or flies which have fed on infected animals.

The micro-organism of anthrax has been studied more than any other save that of tubercle, and some remarkable effects have been produced by experiments with it in the direction both of intensification and attenuation. By cultivating it in bouillon for three weeks its infectious power is diminished, and animals inoculated with it are in large measure protected against the disease. Still further immunity is obtained by a second inoculation with material not quite so weak. Animals thus treated a second time are protected for some time against

the most virulent form of the disease. Woolbridge secured
immunity by cultivating the bacillus in an alkaline solution at
blood temperature for two days; he then filtered the fluid and
injected a small quantity of it into the subcutaneous tissue of
rabbits, which remained well and resisted injection of most
virulent blood. Some of Koch's pupils have isolated an albu-
minose from anthrax cultures, which renders small animals im-
mune against the most virulent cultures. This was prepared
by a precipitation with absolute alcohol, and was separated
from all possible ptomaines by the same medium. It was then
redissolved and filtered through the Chamberland filter. An-
imals which were inoculated with virulent anthrax spores and
injected at the same time with this albuminose recovered.
Ten mice each received one-millionth of their body weight of
anthrax albuminose, and anthrax culture at the same time. Of
these only three died. Vaccination after this fashion has been
carried on extensively, among sheep, by Pasteur and his pupils
or assistants, and a large degree of success has been attained,
although by no means all the animals have survived; and the
spread of the disease in France has thus been largely checked.

On the other hand the virulence of the bacillus is increased
by successive inoculations in susceptible animals, although it
is decreased by passing through different species of animals.
It has also been found that attenuated virus will become more
virulent by adding certain substances, for instance, a very
small proportion of lactic acid; one five-hundredth part of this
acid, added to a mixture and allowed to stand for twenty-four
hours, doubles its virulence. If to this mixture a little fermen-
tescible sugar is added, in another day the virulence becomes
extreme, and frogs, which inoculated with ordinary virus live
from forty to fifty hours, when vaccinated with this intensified
material die in from twelve to fifteen.

When the spores of anthrax are inhaled, we have primary
bronchial and pulmonary lesions. When ingested with in-
fected food or water, we have primary intestinal anthrax.
Secondary specific bronchitis, pneumonia or enteritis are met
with in almost all cases, if time enough elapse. When the
spores are inhaled they lodge upon the mucous membrane,
are quickly converted into bacilli, and then insinuate them-

selves between the cells and into the capillary vessels. In the intestine they affect the mesenteric side of the bowel, lodging usually upon the more prominent ridges of mucous membrane.

Bollinger classified lesions in man as follows:

1. Anthrax acutissimus or apoplectiformis.
2. Anthrax acutis.
3. Anthrax sub-acutis.

External infection is usually produced through a small wound or abrasion. If the microbe meets with sufficient resistance at the point of invasion, its activity is largely or entirely localized; if not, it enters the blood-vessels, causes general and fatal infection. The so-called malignant pustule is in large measure determined by anatomical structure, which needs be dense and vascular. This quickly forms a phlegmonous necrotic area, resembling in most respects a common carbuncle. If, however, a vein be opened in the infectious process, general infection is not prevented by formation of thrombi. There is another form of this disease known as *anthrax œdema* which occurs in parts composed of loose connective tissue with meagre blood supply, conditions met with about the eyelids and neck. Here the disease appears as a flat infiltration without well-defined borders, the skin being little or not at all discolored, while an œdema spreads rapidly in all directions. General infection occurs more easily from this form than from the other, although spontaneous cure is possible. So long as infection remains local, there are few general symptoms; but with general infection we have signs of rapid and overwhelming sepsis.

In man this inflammation seldom terminates in suppuration without secondary infection by pyogenic cocci, which, however, may easily occur. Bollinger believes that in his first and most virulent form the rapid growth of the bacillus in the vessels brings about a sudden diminution of oxygen, and a surplus of carbonic di-oxide with consequent asphyxia; but experiments fail to confirm this view. Another hypothesis is that death results from mechanical causes, that is, obstruction in the blood vessels from large numbers of bacilli; but this is not borne out by facts. The view that the essential toxic

agent is some chemical substance generated by the bacilli has much more to commend it. Bollinger and others have succeeded in separating from anthrax cultures an alkaline substance or alkaloid having profoundly toxic effects, and, without rehearsing the various experiments which have been made, there is every reason to believe that the fatal termination from anthrax is largely due to the action of toxic ptomaines or of toxines produced by the bacilli as products of their growth.

Woodhead and Wood have experimented with a combination of anthrax and bacillus pyocyaneuş, and they have found that anthrax bacilli which would kill a control animal in three days required nearly three times as long when twice a day a sterilized pyocyaneus culture was injected underneath the skin. They are of the opinion that this effect is not produced through phagocytosis, but through an antagonism of poison, since outside of a body the anthrax bacillus grows very well in a culture of green pus.

MALIGNANT ŒDEMA.

The disease known as malignant œdema, to whose parasitic nature especially I desire now to call attention, has been recognized for some time under such names as *gangrène foudroyante* (Maisonneuve), *gangrène gazeuse, acute purulent œdema* (Pirogoff), *septicémie suraiguë and septicemie gangrèneuse;* also as *gangrenous emphysema.* The term under which we speak of it, namely, malignant œdema, was given it by Koch, who identified its parasite. It is one of the most dangerous forms of gangrenous inflammation, which occurs sometimes after serious bone injuries, and sometimes after so trifling lesions as those inflicted by dirty pointed instruments, or even the stings of insects.

The characteristic feature of the disease is the rapidity of its spread, the septic character of the inflammatory product, and the speedy destruction of the tissue involved, with the formation of gas. A dirty brownish, reddish skin, mottled with blue, whose veins are filled with stagnant blood, covers the affected areas. The underlying tissues are sodden with

fluid and distended with gaseous products of decomposition, so that the finger feels a fine crepitus, as is common in subcutaneous emphysema. From the wound, if there be one, flows a thin, foul smelling secretion, which may also be expressed from the deeper layers. That the neighboring lymph spaces, vessels and glands are actively participating in the transmission of septic products is evident from the enormous swelling which the latter present, and from the general condition of the patient. The rapid elevation of temperature, with but trifling remission, remains constant until shortly before death. The tongue early becomes dry, cleaves to the palate, its surface covered with thick foul fur. Consciousness is early lost and patients become peculiarly apathetic, complaining only of pain and burning thirst. Sometimes they are delirious instead of apathetic; coma, incontinence, frequent and superficial breathing and dilatation of the pupil are the precursors of death, which may occur in from fifteen to thirty hours. In rare cases life has been saved by the introduction of most vigorous stimulants and sustaining measures. After death the cadaver bloats quickly and putrefaction goes on with singular rapidity. At the seat of the lesion muscles and tendons will be found macerated, the bone denuded, surrounded by a putrid fluid, and the entire region presenting a notable swelling and infiltration of the soft parts with reddish fluid and stinking gases. It is in this fluid that one finds the largest number of microorganisms. The overlying skin will be stretched and superficial blebs or blisters may typify the intensity of the process. The water-logged muscles are friable, the veins are engorged with black and decomposed blood and broken down thrombi, and in the heart and large vessels will be found at the same time putrid liquid and gas, to the presence of which latter the early and sudden death has been with much propriety attributed, since it may cause death in the same way as does air embolism. The viscera are congested and œdematous, and present hæmorrhagic infarcts.

This terrible complication supervenes ordinarily within from eight hours to six days after injury. Its approach has been sometimes betokened by depression and sadness and by chills. Frequently excessive pain and sense of constriction are com-

plained of around the wound. Sometimes the skin has
assumed such a peculiar appearance as to justify the term
bronze erysipelas, given it by Velpeau (*erysipèle bronze*). The
gaseous products of putrefaction, crepitating under the finger,
rapidly infiltrate the wound, distend the cellular tissue and ex-
tend along the vessels to the glands. The injured spot instead
of suppurating simply dies and emits an abundant sanious
liquid.

It remained for Koch, in 1882, to demonstrate upon the
smaller animals a pathogenic bacillus which he had recognized
and cultivated, and which also Pasteur had described under
the name *vibrion septique*. This organism is a bacillus much
resembling in form and size that of anthrax. Nevertheless it
has certain important points of difference by which it can be
easily recognized. It is somewhat smaller than the bacillus
of anthrax, has rounded ends, and is joined in threads after a
fashion quite different. It possesses the property of spontan-
eous motion, which anthrax bacilli do not possess. The most
important morphological difference, however, is in spore form-
ation, since when these bacilli produce spores they enlarge in
the middle or at one end, in which enlargement the oval, bril-
liant and bluish spore is soon developed. Bacilli of malignant
œdema take stains just about as do those of anthrax, but they
evince much less resistance to Gram's method than do the
others; it is in cultures that they show the widest differences.

They do not grow on gelatine plates after the common fash-
ion nor even in needle cultures except when the needle is
driven down deeply, almost to the bottom of the gelatine tube,
and then they grow along the lower portion of the needle
track. Thus it will be seen that these bacilli belong to the
most marked form of anærobic organisms with which we are
acquainted, and that they grow only when oxygen is entirely
excluded. Pasteur was the first to succeed in cultivating them
in this medium with the exclusion of air. Gaffky invented a
method of cultivation by introducing into the interior of a
cooked potato a fragment of tissue in which they were grow-
ing. Hesse later taught how to make pure cultures of them
in agar and gelatine, by simply sinking fragments of infected
tissue into the depths of the tubes, while Flugge, by resorting

to cultures in vacuo, succeeded in attaining the same object.

The bacilli of malignant œdema grow best in nutrient gelatine to which 1 or 2 % of grape sugar has been added. In such a medium the needle streak shows the development of the organisms at first in its lowermost portion by a series of minute varicosities, which consist in the interior of opaque fluidified gelatine, and around the margin of fine radiating streaks. In their further course the entire lowermost portion of the gelatine liquifies and becomes opaque. In agar they behave in much the same way, save that they do not fluidify the medium. The minute chemistry of these changes is not known. It can hardly be considered a putrefaction since no foul-smelling product is produced. On agar plates where they can be grown in an atmosphere of hydrogen the colonies show very distinctly. Coagulated blood serum is quickly fluidified by them with production of gas. In all media they grow best at body temperature, although even at 18° or 20°C. they show a typical proliferation. According to most authors spores are never formed in the living body, spore formation being apparently a post-mortem phenomenon.

In most respects these bacilli behave as out-spoken saprophytes. Their known habitat is, in fact, the outer world, from which do they only rarely make an incursion into the animal body. They are most commonly met with in the outermost layers of the soil, and garden earth nearly always contains them. Aside from this they may be met with in any kind of soil or dust. The researches of Gaffky seem to make it clear that the bacilli may penetrate from the intestinal canal into the body tissues. The horse seems to manifest the greatest predisposition for the disease, although it may be met with or artificially produced in all domestic animals. A few years ago Brieger and Ehrlich reported an extremely interesting case of malignant œdema following typhoid fever, in which the disease followed a clinically typical course to its fatal termination. Rosenbach later reported two typical cases not connected with typhoid, in which he found the bacilli in question. We must not omit in this place, however, to mention that gangrenous emphysema, more or less resembling the disease under consideration, may be produced by other bacteria, especially

the more ordinary putrefactive forms, and that the necrosis or gangrene proper, which is so significant a part of the picture in malignant œdema, is not primarily produced by the specific bacilli, as may be proven by the results of experiment. When a pure culture of these specific bacilli is injected, there is produced a most extensive hæmorrhagic œdema of the subcutaneous cellular tissue without any appearance of putrefactive action; and quite free from gas formation; but when an impure culture is injected, or when garden earth is used for in-inoculation, the distinctive œdema of the previous instance becomes a mixture of emphysemic œdema and gangrene, which latter is, in all probability, due to a mixed infection of the common putrefactive forms, among which, perhaps, may be reckoned the pseudo-œdema bacillus of Liborius.

Experiments on animals seem to indicate that an ordinary cutaneous inoculation is of no effect, nor even is an intra-veinous infection of the organisms. They need to be planted subcutaneously in the areolar tissues in order to produce the typical results. Those which are injected into the blood probably find in the arterial capillaries too much oxygen to permit of their living. The fact that they do not enter through a mere abrasion of the skin is probably the secret of the known immunity of man and beast from this disease, since the earth in which laborers work day after day with abraided hands and feet, and yet with impunity, is the same as that which, introduced beneath the skin of a guinea pig, will quickly determine its death. Nevertheless, the disease is not always fatal, and the larger animals not infrequently recover. Microscopical examination of the tissues from an infected area, supposing the examination to have been made immediately after death, shows that the bacilli are never found inside of the blood-vessels, but mainly in the superficial tissues of the thorax and abdomen, or possibly in the lymphatic spaces of the pleura or of the peritoneum. The blood and tissues of the mouse constitute a possible exception to the above statement. According to certain French investigatiors one attack of this disease confers immunity from subsequent infection, but the opposite view has been taken by others, that one invasion of the disease leaves the system particularly susceptible to others.

Last summer a case was related to me by a Russian physi cian, Dr. Rekowski, of malignant œdema apparently the result of a hypodermic injection of a solution of morphine. At that time the Doctor was investigating this subject in the laboratory of the Hygienic Institute in Berlin. I have not yet seen any publication of his results, although I know he intended to ascertain the effect of morphia in solution as accelerating or inhibiting the growth of these organisms. At all events such a case as this adds this possible danger to the already formidable list of dangers from injections of solutions not freshly made.

Quite recently Roger has made some very interesting experiments with the bacillus of malignant œdema, and has shown that rabbits possess refractory organisms, but if he introduced at the same time virulent œdema bacilli along with the bacillus prodigiosus, there developed the most characteristic features of œdema, and the animals died inside of twenty-four hours. The œdema bacilli could be recognized in the blood and in the internal organs, the other variety only at the point of inoculation. The œdema bacilli from the first animal were now able to kill the second when inoculated, but when the third was inoculated from the second there was no result. These experiments are convincing that microbes which are not pathogenic for a certain species of animal can be made so when inoculated together with others.

RAUSCHBRAND.

Rauschbrand is a disease quite common among cattle in central Europe, known to the French as *charbon symptomatique*, and to the Italians as *carbonchio sintomatico*, while in Great Britain it is called the *black-leg*. It is a disease very similar in its manifestations to malignant œdema, is well known to be due to an anærobic bacillus, and has so much in common with malignant œdema that I have proposed to speak of it for a moment here, although I have been unable to find in literature any case in which a human being has been attacked with it. A most marked difference between the two forms of trouble is the formation of gas in the diseased tissue, which in

the case of malignant œdema is of putrefactive odor; otherwise it might be hard to tell sometimes with which condition we have to deal.

The bacilli of rauschbrand possess many similarities to those of malignant œdema. In form and size there is of course a resemblance, but with minute differences in the manner of spore formation; while the rauschbrand bacilli seem to be in the highest degree anærobic. In their manner of growth there are also trifling yet distinctive differences, and it is found that inside of living tissue spore formation, which apparently takes place only at the end of each organism, occurs with greater freedom. They are also more motile than those of malignant œdema. The most notable differences are observed in different animals in their liability to the two diseases. Cattle are apparently the proper victims of rauschbrand, while they are not subject to malignant œdema. On the other hand swine, dogs, rabbits, fowls and pigeons are but little, if at all, subject to rauschbrand, but succumb very readily to œdema. Horses can be made to react upon artificial inoculation, but appear never to suffer from spont neous rauschbrand. They are ready victims to the bacilli of malignant œdema. Another significant difference between the organisms is their common habitat. Oedema bacilli seem to be found everywhere in the more superficial layers of earth, whereas rauschbrand seems to be strictly confined to certain localities, although what it is that brings about this state of affairs is not yet known. Again, survival from one attack of rauschbrand, or vaccination with attenuated virus, seems to confer immunity, whereas this is not the case with malignant œdema, but rather there seems to remain an increased susceptibility to the disease.

It was, indeed, a recognition of the former fact, namely, the immunity which one attach of rauschbrand confers, that led Arloing and his co-workers to practice protective inoculation, which now has been very extensively carried out; and it seems to have served a most excellent and useful purpose. It seems to be the general conclusion that rauschbrand bacilli are capable of transmission from mother to fœtus, and that the latter may be affected in this way. The positive proof of this fact which has apparently been furnished is of wide reaching im-

portance, because if it can occur with one organism, it can undoubtedly with others, and this is a principle which needs to be well established because of its important bearing upon the question of transmission of disease. Within the past year or two there has been apparently a large amount of interest excited in these questions, and a number of workers have devoted a large amount of time and energy to the work, especially in estimating the absolute protective value of preventive inoculation as against this disease, as also in putting an estimate of the money value and giving the whole matter an aspect of national financial importance. The outcome of this work appears to indicate that preventive vaccination offers nearly the same protection against rauschbrand that in another way it offers against small-pox in the human race.

Roger has studied the immunity of rabbits against rauschbrand. It is possible to increase their natural immunity by injecting into their veins daily a number of rauschbrand bacilli. If, after this, rauschbrand bacilli and b. prodigiosus mixed together are injected into the muscles, then the animal shows at most some reaction, from which it soon recovers. Whereas were not the specific bacilli first injected in the veins they would always perish.

From a series of experiments of this kind, suitably varied, Roger comes to the conclusion that the chemical products of the b. prodigiosus do not, as he had at first supposed, alter the tissue at the point of inoculation, but that they act on the entire organism. He obtained the same results with pigeons, which, like rabbits, are refractory to the disease. The susceptibility of rabbits to this disease after the injection of the prodigiosus does not remain long, and they soon become refractory again. He found further that rabbits, which were not affected by intramuscular injection of rauschbrand bacilli, developed the disease when the same were injected into the anterior chamber. From this they died in eighteen to forty hours. The eye is swollen and often contains gas. The entire organ becomes sodden with bloody fluid in which bacilli abound. A similar exudate occurs at the base of the brain. If he injected rabbits in both ways at the same time, *i. e.*, in the anterior chamber and the muscles of the thigh, then

rauschbrand bacilli were found also at the latter point. A
sterilized infusion of muscles thus affected, injected into another
rabbit, produced somnolence. If, at the same time, the injected
animal were also inoculated with virulent rauschbrand it quickly
died; but if the inoculation were postponed twenty-four hours
it became in the mean time insusceptible.

Farcy: Glanders.

Various authors have described from a clinical point of
view four varieties of this infectious malady, which have been
described under the terms acute and chronic farcy and acute
and chronic glanders; under the former term grouping those
varieties in which the superficial tissues are the more affected,
and under the latter those in which the deeper cavities, like
the nasal fossæ, the lungs, and the deeper glands, are affected.
To-day, however, these descriptions have much less import-
ance, since we recognize the same infectious agent active in
them all, and we know that by means of a lymphangitis ex-
tending from a farcy bud, we may be led to find a deep ab-
scess, and that the deep ulcerations in the complicated cavi-
ties of the skull differ in no essential respect from those upon
the skin.

Some of the difficulties of diagnosis in some of these cases
may be gathered from such a case as the following which
Bucquoy reported to the French Academy of Medicine in
1883:   A young man, æt. 19, of alcoholic habits, and suffering
from recent syphilis, was admitted into the hospital, displaying
upon one leg a fungus ulcer as to whose origin he was entirely
ignorant; and upon the thigh of the same side was a small
fluctuating swelling of livid hue, quite like abscesses which
one observes after contusions; his general condition seemed to
be that of typhoid fever.   On the fourteenth day after admis-
sion there appeared on each side of the ankle a phlegmonous
swelling with redness and œdema; on account of this arthritis
the diagnosis of typhoid was discarded and the case was re-
garded throughout as one of some septic or purulent infection.
His condition became more serious; four days later he was
delirious and other joints became involved after the same

fashion, while the synovial cavities were distended with fluid; the abscess about the ankle was opened and considerable pus evacuated. On the following day he was unconscious, and a peculiar bullous eruption appeared all over the body. On account of this eruption the specific infection of glanders was suspected, although there were no nasal symptoms. He died twenty-two days after admission. The liver contained a large abscess and many of the joints contained pus. The true character of the disease was established by careful inquiry into his antecedents, which showed that he had come in contact with horses suffering with glanders, and by the results of inoculation of some of the fluids upon animals. An ass inoculated with some of this material developed a very typical swelling of the sub-maxillary glands, and died ten days after vaccination.

We do not at present recall any other case where the diagnosis was established or verified by such inoculation.

The specific organism of glanders, known as the *bacillus mallei*, has perhaps been the most carefully studied by Löffler. It is a little shorter and broader than the tubercle bacillus, varying but little in length. Commonly they are found in pairs side by side, often held together by a little hyaline material which takes no stain. In fluid media they show active molecular motion, but no spontaneous motility. The organism is peculiar in this respect, that by no means all of the bacilli form spores, and spore formation seems to occur only at times, upon the favorable surroundings. Reaction to staining media is peculiar, since these bacilli take no basic aniline dyes. They grow best on blood serum and potato, but may be cultivated in other media. They show about the same degree of resistance to heat and chemicals as other nonspore-bearing bacilli —are destroyed by exposure for ten minutes to a temperature of 55° C. The animals which are most susceptible are the horse, cow, sheep, guinea-pig, rabbit, white rat, cat, tiger and lion; while common pigs, dogs, the common rat and domestic fowl enjoy great immunity.

EDITORIAL ARTICLES.

SNOW ON THE REAPPEARANCE OF CANCER AFTER APPARENT EXTIRPATION.[1]

In this monograph Mr. Snow discusses some important points gath ered from a 13 years' experience, at the Hospital for Cancerous Diseases, at Brompton, in the matter of recurrence of malignant tumors after operation. Although the paper does not claim to present the subject in a systematic manner, vet it is teeming with practical and important details, the result of accurate observation and the desire to present the subject in a manner to be readily utilized by the surgeon.

Snow claims that every carcinomatous growth is originally a purely local affection, and, hence, as the only hope for saving the patient's life urges the importance of an early and radical extirpation of the diseased structures, in order to prevent what must eventually become a general infection through the lymph channels.

As to the pathology of the disease Snow believes that under certain circumstances, circumscribed accumulations of cells are removed from the influence of the harmonious and vital processes, this, in its turn, depending upon new influences, and pursue thereafter a patho logical, or unphysiological, to say the least, course. The most powerful predisposing causes, therefore, are found in those influences of a general debilitating character, and of this, the important relation to disturbed psychical conditions, such as sorrow, anxiety, care, etc. Such stress is placed upon the latter, that the author advises in all cases where these are present in conditions with evidences of some general dyscrasia, that suspicion of carcinoma should be excited at

[1]Monograph, London, 1890, J. A. Churchill.

(250)

once. Under the direct causes are to be first mentioned traumatism. Out of 9,600 cases of carcinoma mammæ, 11.5% were due to injury, or to local tissue disturbances by cicatricial contraction, or syphilitic infection of the marhmæ.

The term recurrence, as used by the author, is understood to imply only the growth of diseased tissue which has been permitted to remain. In consequence of this, no confidence is felt in measures other than those designed to attack the growth *in loco*, so long as a generalization of the disease has not occurred. The reappearance of the disease at the site of the original operation occurring after two years is not to be considered as a relapse or recurrence, but as due to newly arising noxious influences, identical, however, with those producing the original disease. It should be borne in mind, however, that many recurrences are insidious and almost without symptoms in the course of their growth, particularly those which recur in the cicatrix. Nothing short of a systematic espionage of the parts at short intervals by the surgeon and prompt interference will suffice to protect the patient against an advanced state of the recurrent disease The continual presence of the smallest carcinomatous foci, even when generalization of the disease is already in progress, is not infrequently marked by a symptomless course, as, for instance, in scirrhus. Among the most prominent symptoms of the presence of such foci are to enumerated enlargement of the supra-clavicular glands, shooting pains in the cicatrix, vague rheumatic like pains in the back and in the extremities, as well as a general feeling of weakness of the latter. Snow has demonstrated the presence of a cancerous change in the medullary substance of the long bones, together with osteomalacia, and accounts for the presence of the last named symptoms, as well as the quite well-marked tenderness upon pressure over the manubrium sterni, frequently observed in this class of cases, to this condtion Hypertrophy of the corresponding humerus and ribs are likewise to be noticed in this connection

As to the age of the patient, and the character of the growth in the breast corresponding therewith, the latter occurring prior to the thirtieth year may be considered benign, although all forms of these,

particularly cystic growths, may undergo degenerative changes   In mammary carcinoma almost without exception the axillary glands are found to be infected at the time of the first examination.   This holds good particularly for ⊢cirrhus; the exceptional instances are those cases of soft and rapidly growing carcinomata.   The location of the growth likewise bears some relation to the occurrence of axillary gland infection, as those lying within the segment external to the nipple give rise to axillary infection earlier than those lying toward the sternum.   Scirrhus within the areola pursues a notably chronic course.

Total, as well as early, extirpation of the diseased parts is insisted npon, and this is held to include all glandular structures, recognized as such, in the neighborhood.   Snow asserts that the condition of elephantiasis of the arm, so frequently observed subsequently in cases of recurrence, and giving rise to great suffering, is due to the presence of diseased lymph glands in the neighborhood   In the discussion of operative methods, the suggestion is made that incisions should be so placed as to include all diseased portions, and to pass directly downward to the pectoral muscle, rather than in a slanting direction, as is commonly done; no attempts to spare the skin are permissible, according to Snow.   In the illustrations it would appear that the incisions were so planned as to almost circumscribe the mammary area. The pectoral fascia is held by Snow as a sort of a barrier against the progress of the carcinomatous infection, although admitting with Haiddenhain, the presence of glandular structures beneath the not infrequently observed process of mammary tissue passing beneath this fascia.

The question of occurrence of carcinoma in the remaining breast is always an interesting one.   It is now held that this occurs, not so much from a general dyscrasia as from either, first, a direct infection through the subcutaneous lymph channels, in which the line of carcinomatous infection may be traced by means of a series of nodular infiltration depots, or secondly, by means of the deep lymphatics, in which case the bony chest-walls themselves become invaded; or finally, from secondary or metastatic deposits in the anterior mediastinum or chest·

walls.   In all instances in which the second breast is attacked by the disease, there is rarely, if ever, ulceration present; there is rather a generally diffused infiltration of the breast and the surrounding struc- tures, and, inasmuch as there is usually but slight disturbance result ing from its presence, and life is scarcely shortened thereby, amputa- tion of the breast under the circumstances is not indicated.

There can be no doubt that all tumors in the female breast are sources not only of great anxiety, but likewise of danger to the patient. Clinical experience has shown, again and again, that fibromata and adenomata, even those occurring in childhood, should they be per- mitted to remain during adult life, may and do become the seat of degenerative changes.   Therefore,, the advice is given to remove all tumors in this region without regard to their nature, should their pres- ence persist after a fair trial of resorbent local remedies.   In these in stances it is not generally necessary to remove the entire breast; the area to be included in the extirpation of the tumor cannot always be definitely determined beforehand; some suggestion as to the amount to be removed may be gained during the operation by the condition of the tissues, and particularly by the blood supply. The activity of the circulation in the gland is increased in the immediate neighborhood of the growth and it is, therefore, best to extend the dissection beyond the area of tissues in which bleeding is free and easily provoked.

GEORGE RYERSON FOWLER

After calling attention to the fact that in India, unlike Europe, rhinoplasty is usually performed to repair the results of mutilation generally in young, healthy and robust patients, whereas in Europe the operation is performed to make good damages due to the ravages of syphilis or lupus, the author remarks that in fifty cases of the former he had employed the Indian operation which had been vastly improved, chiefly by his assistant, Mr. Gunput Singh The main point considered, was to overcome the difficulty of the formation of the columna, and to obviate the continued tendency to contraction in the anterior nares of the newly formed nose, a tendency which continues several months after operation.. The shape of the flap, to be employed in a case of lost nose where the entire cartilage, both alae and the columna have disappeared, is quite different from that ordinarily figured in the text-books, as shown in figure 1. The size, or superficial area of the flap, as distinguished from its shape or outline, will depend a
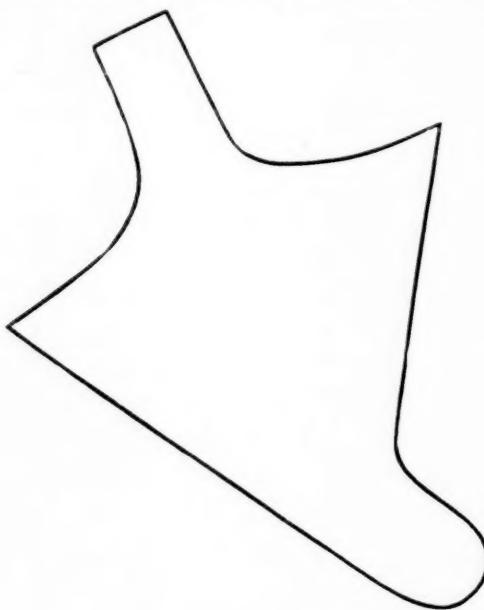
FIG. I.—OUTLINE OF THE FOREHEAD FLAP.

good deal upon the make or cast of face of the patient; if his nose was originally a long one, the flap will be proportionately longer, if portions of the alae nasi and columna be left intact, the shape of the

[1]Surgeon Major D. F. Keegan, M.D. (Indore, India), in The Lancet, Feb. 21, '91.

forehead flap must be modified to suit the requirements of the case. The pedicle of the flap should occupy the internal angle of the eye, care being taken to avoid wounding the angular artery; the flap should be marked out obliquely, not perpendicularly, to a line connecting the eyebrows. In Eastern women, who have low foreheads, it is often necessary to encroach on the scalp to provide for the columna; and although; under such circumstances hair grows upon the newly formed columna, even this is preferable to deforming the mouth by taking the columna from the upper lip, as the hair can be clipped with the scissors.

In operating, the patient having been fully anæsthetized, the cavities on both sides of the septum nasi are plugged with pledgets of cotton-wool to which strings or sutures are attached. Two converging incisions are now carried from two points slightly external to the roots of the alae nasi to two points about three quarters of an inch apart on the bridge of the nose where a pair of spectacles would rest; these two points on the bridge of the nose are now joined by a longitudinal incision, which is bisected and a perpendicular incision is drawn downward from the point of bisection nearly as far as where the nasal bones join on the cartilage of the nose, following the course of the junction of the nasal bones but not extending as far as their inferior borders. The skin and tissues are now dissected cautiously from off the nasal bones from above downward in two flaps, ABCD and EFGH, as in figure 2.

FIG. 2.—PLAN OF LINING FLAPS.

ABEF, Line across bridge of nose.

ABCD, EFGH, Outline of flaps

IKL, Line of margin of mutilated nose.

The inferior borders of the flaps, CD and GH, are not divided and constitute the attachment of the flaps to the structures and tissues which clothe the inferior borders of the nasal bones where they join on to the cartilage of the nose. A piece of brown paper of the shape of the desired forehead flap is now stuck firmly on the forehead in a slanting direction, and a very sharp knife is run around the border of the paper.

The paper is removed, and the flap is quickly raised, embracing all the tissues down to the periosteum, and subjected to as little hand ing as possible. The sides of the gap now left in the forehead are approximated as much as possible by means of horsehair sutures, and it is surprising how small a raw surface is left behind on the forehead, if the approximation of the sides of the gap be judiciously and expeditiously carried out. A nidus or bed for the reception of the columna is now prepared, after the two flaps, ABCD and EFGH, which have already been raised off from the nasal bones, are reflected downward; and, as they overlap in the center two triangular pieces are cut away and placed in the middle of the gap left in the forehead, in order to expedite the process of cicatrization in the frontal scar. The forehead flap is now brought down over the nasal bones and rests inferiorly on the two reflected flaps, ABCD and EFGH, taken off the nasal bones, and the nostrils of the newly formed nose are therefore lined inside with the skin or cuticular sides of the reflected nasal flaps. The free infe rior margins of the forehead flap and the nasal flaps are now brought together by horsehair sutures. The columna portion of the forehead flap is now fixed in the bed prepared for it by sutures, and the two original incisions drawn from the root of the alae nasi on either side to the bridge of the nose are now deepened and bevelled off for the reception of the sides or lateral margins of the forehead flaps; these are most accurately attached by means of horsehair sutures to the bed prepared for them. Drainage tubes are inserted in the newly formed nostrils, and the parts properly dressed. After a fortnight the pedicle of the new nose is divided, and in doing so a wedge shaped slice is cut out of the root so that the new nose may not be parrot shaped. The utilization of the skin flaps not only counteracts the tendency to contraction and flattening, but gives strength and support to the nose.

<div style="text-align: right">JAMES E PILCHER.</div>

THE INITIAL SEATS OF NEOPLASMS AND THEIR RELATIVE FREQUENCY.

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THE subject of which I am about to treat, notwithstanding its fundamental importance, is one that has never before been thoroughly investigated.

Indeed the requisite data for such an undertaking are themselves of comparatively recent origin. I refer to the Registrar's Reports of the Middlesex, University College, St. Bartholomew's and St. Thomas' hospitals for the last sixteen to twenty years. These reports constitute the beginning of a statistical history of disease.

It is to be hoped that in future publications, authors will avail themselves of these rich stores of facts more than has hitherto been customary, instead of trusting to mere impressions which are often erroneous. Here, as in other branches of knowledge, advancing science demands greater accuracy.

In my work on the *Principles of Cancer and Tumor Formation* I have pointed out that, since the origin and development of neoplasms follows a course homologous with that of the tissues in which they originate, we may classify these growths, like the normal tissues in association with which they develop, according as they originate from cell derivatives of the one or the other of the germinal layers. That is to say, they are either of *archiblastic* (epithelial) or *parablastic* (connective tissue) origin.

Now, on making an analysis of 14,480 primary neoplasms of all kinds, consecutively under treatment, I find that 10,409 originated from the archiblast, and only 4,071 from the

parablast. Whence it follows that the liability of the two great tissue-systems to originate neoplasms is very different; for these growths arise much more frequently from archiblastic than they do from parablastic structures. This remarkable fact may be explained as a particular instance of what I maintain is a general law, viz.: that the neoplastic process, like agamic reproduction in general, is most prone to arise where lowly organized cells are most abundant. For, of all tissues of the body. the archiblastic ones have on the whole departed less from the primordial type than any others; this is especially seen in that they consist entirely of cells which still retain in a marked degree much of their primitive powers of growth and reproduction.

The subjoined table, based on 14,480 cases, more fully illustrates the matter. Thus of 100 neoplasms:

ARCHIBLASTIC (72 PER CENT).

Epithelioma*	54.5
Adenoma	3.5
Papilloma	2.6
Cystoma	11.4

PARABLASTIC (28 PER CENT).

Sarcoma	9.4
Fibroma	11.5
Lipoma	3.8
Osteoma	1.8
Chondroma	.5
Angioma	1.0

*The term "epithelioma" is here used in the sense of malignant epithelial neoplasm and therefore as synonymous with the terms cancer and carcinoma.

Passing next to the question of *malignancy*, what I find is that 64% of all neoplasms are malignant, and 36% non-malignant.

Of the *malignant* neoplasms 54.5% are of archiblastic (epithelial) origin, and 9.5% of parablastic (connective tissue) origin.

Of the *non-malignant* neoplasms 17.5% are derived from the archiblast (including cysts) and 18.5% from the parablast.

Or it may be stated in this way: 54.5% of all new growths are *cancers*; 9.4% *sarcomas*; 24.7% *non-malignant* neoplasms, and 11.4% *cysts*.

In further illustration of this subject I submit the following tables, based on the analysis of 15,481 primary neoplasms, consecutively under treatment at the four above-named metropolitan hospitals, during the last sixteen to twenty-one years. From these it will be seen that the liability of some parts of the body to originate neoplasms is very much greater than that of others. I propose to distinguish these localities as the *neoplastic areas.*

Perhaps the most general statement that can be made on the subject is that the neoplastic process is most prone to arise where organization is lowest, and that this tendency almost completely disappears where organization is highest.

The relative frequency of the *neoplastic process* in its chief seats I have found to be as follows:

	Per Cent.
Uterus	19.2
Breast	17.5
Skin	9.4
Connective tissue	7.7
Tongue and Mouth	6.3
Ovary	5.8
External genitals	5.1
Bones (except maxillæ)	4.0
Rectum	3.3
Maxillæ	2.9
Stomach	2.6
Lip	2.6
All others	13.6
	100.0

The most noteworthy feature in connection with this statement is the great frequency with which the *reproductive organs* (breast, uterus, testis, ovary and external genitals) originate neoplasms; 48.3 % of all neoplasms arise in connection with these organs. The very great frequency with which the *uterus* and *breast* are attacked is particularly striking. It may be inferred from the fact that both of these organs are subject to remarkable morphological changes, long after completion of the fœtal development, that they are rich in lowly organized cells, which still retain much of their embryotic potentialities. It is probably this peculiarity which renders them so much more prone to originate neoplasms than other parts. On reference to Table II it will be seen that in the *uterus*

neoplasms arise with great frequency, both from the epithelial and the fibro myomatous elements; whereas, in the *breast* very few originate elsewhere than in the glandular epithelium. Phenomena of similar importance are noticeable with regard to neoplasms arising in the skin, tongue and mouth, ovary, external genitals, rectum, stomach, lips, œsophagus, and many other parts. On the other hand, in the *maxillæ, connective tissue, bones, eye, etc.*, most neoplasms arise from parablastic elements.

From these examples will be gathered that the relative liability of the same tissue elements to originate neoplasms varies in different localities.

Among the parts in which neoplasms very rarely originate must be mentioned *highly specialized structures* in general, such as the heart, pericardium, large blood vessels, voluntary muscles, spinal cord, nerves, ligaments, etc.

It will also be seen that *obsolete structures* have but little tendency to take on the neoplastic process, *e. g.*, the male breast, suprarenals, clitoris, prostate, thymus, intervertebral discs, membrana nictitans, vermiform appendix, coccyx, etc.

Other situations in which neoplasms rarely originate are the spleen, urethra, lachrymal gland, vertebræ, upper lip, small intestine, etc.

Previous authors, in estimating the relative frequency with which the various organs develop *epithelioma* (cancer), have based their statements on mortality records. My results have been obtained from the study of living patients. They are as follows:

	Per Cent.
Breast	25.6
Uterus	21.5
Tongue and mouth	11.0
Skin	7.6
External genitals	4.6
Rectum	5.4
Stomach	4.8
Lip	4.5
Liver	3.1
Œsophagus	2.4
Intestines (except rectum)	1.3
All others	8.2
	100.0

In the main these results accord with those arrived at by other British observers.

Nunn,[1] for instance, gives the relative liability as uterus, 38.9%; breast, 26%; stomach, 2.77%; and Sibley's[2] estimate nearly corresponds with this.

Continental authors are, however, practically unanimous in placing the *stomach* at the head of their lists; whilst a comparatively insignificant place is allotted to the breast, tongue and mouth and skin. Thus Salle,[3] basing his estimate on 1358 deaths from cancer in the Paris hospitals, gives the order of relative frequency as follows: Stomach, 32%; uterus, 28%; liver, breast, rectum, mouth, etc.

Marc D'Espine's[4] analysis of 889 deaths from cancer in the Canton of Geneva, during a period of twelve years gives the following result: Stomach, 45%; uterus, 15%; liver, 12%; breast, 8.5%; intestines, except rectum, 3.3%; rectum 3%; skin, 1.7%; tongue and mouth, 1%.

Virchow,[5] from examination of the mortality returns of Würzburg, during a period of three years, estimates the liability of the stomach at a still higher rate; thus: Stomach, 54.9%; uterus, 18.5%; rectum and intestines, 8.1%; liver, 7.5%; face and lips, 4.9%; breast, 4.3%.

Tanchou's list,[6] based on 9,118 cancer deaths from the Paris registers, is as follows: Uterus, 37%; stomach, 25%; breast, 13%; rectum, 2.5%; tongue and mouth, 0.5%.

The discrepancies between these continental estimates and those of British authors, appear so irreconcilable in several respects, that they probably indicate varying proneness of the organs to evolve cancer in different countries. The subject is one of great interest, and requires further investigation.

I will now offer a few remarks with regard to the greater liability of *certain parts of particular organs* to originate cancer.

[1] Cancer of the Breast. London. 1882, p. 20.
[2] Medico-Chirurgical Transactions, Vol. xlii, p. 114.
[3] Étiologie de la Carcinose. Paris. 1877.
[4] Essai analytique et critique du statistique mortuaire comparée, Géneve et Paris, 1858.
[5] Verhandlg. d. Würzb. Phys. med. Ges., x, 66.
[6] Vide Walshe, On the Nature and Treatment of Cancer.

First of all, with regard to the *female breast*, I have found
that of 132 cases, in 42 the tumor was situated *centrally;* and
in 90 *peripherally*.   In 14.7 % of all cases the disease was
situated *quite outside the mammary gland*.   Of these 90 cases,
in 46 the tumor was situated at the upper part of the breast, in
21 at the lower part, in 20 at the axillary side, and in 3 at the
sternal side.   Of 151 cases, in 56 % the disease was situated
in the *left* breast, and in 44 % in the *right*.   The most striking
feature, however, about mammary cancer in this connection,
is the rarity with which it arises in the *nipple*.   According to
Gross[7] this happens only in 1.31 % of all cases.   Still more re-
markable is the almost complete immunity of the *skin* of the
nipple, areola and mammary region from cancerous disease.
There is on record but a single well authenticated case[8] of
cutaneous cancer of the female mamma.   Those who believe
in the traumatic causation of these growths will not find much
support for their views in these considerations.

Of the cancers originating from the proper tissue of the
mammary gland, the immense majority are of the *acinous* type,
and evidently originate from the glandular acini.   Cancers of
the *tubular* type, which originate from the ducts, are certainly
rare.   I am at present unable to give exact numerical expres
sion to this difference; but from the examination of a consider-
able number of specimens I should be inclined to estimate the
proportional numbers at about 97 for the former, and 3 % for
the latter.

Another fact worth mentioning is the exceeding rarity with
which the *melanotic* variety of cancer affects the female breast.
Among the 2,397 cases of mammary neoplasms in Table IV,
there was not a single example of it.   As the mammary gland
epithelium is a derivative of that of the skin this immunity is
remarkable.   In the *male* breast melanotic cancers are cer-
tainly not quite so rare; for of 100 cases of cancer of this part
collected by me,[9] there were 3 instances of this kind, 2 acinous
glandular cancer, and 1 squamous celled cutaneous epithelioma.

These facts with regard to the origin of breast cancers are

[7]International Journal of Medical Sciences, March, 1888, p. 224.
[8]Czerny's case, Centrbl. f. Chir., No. 24, 1886, p. 28, in the supplement.
[9]Vide Lancet, 1889, Vol. ii, p. 261, et. seq.

paralleled by those relating to *uterine* cancer; thus at least
95 % of all uterine cancers originate from the glands of the
cervix; whereas, only about 3 % arise from the *corpus;* and 2 %
from the *portio vaginalis.*

In the *tongue and mouth* I have found the seats of the initial
lesions (in 100 cases) to be as follows:

CASES.

Edge of tongue (middle, 21; base, 14; tip, 5; front, 4; right side, 25; left side, 18)....	48
Floor of mouth (near frænum)	21
Buccal surface of cheek	10
Gum	5
Dorsum of tongue	4
Empty socket of molar tooth	2
Soft palate	2
Hard palate	2
Floor of mouth (other than near frænum)	2
In substance of tongue	2
Elsewhere	2
	100

In the *skin* the same peculiarity is noticeable. Of 48 con-
secutive cases I found the disease began in the *nose* in 23
cases, *cheek* in 6, *thigh* in 4, *lower eye-lid* in 3, *foot* in 2, *fore-
head* in 2, and 1 each in neck, ear, back, abdomen, knee,
axilla, hand and upper lip.

All parts of the body in which cancer originates manifest
similar peculiarities.[10] It seems to me difficult to reconcile
these facts with Cohnheim's hypothesis.

Passing on to the *sarcomata* I find that they arise from the
bones, connective tissue and certain organs. An analysis of
1,066 cases gives the following percentage proportions: *Bones,*
36; *connective tissue,* 32; certain organs, 32.

The *bones* most liable (in 342 cases) were, in order of rela-
tive frequency: Superior maxilla, 102; femur, 61; inferior
maxilla, 48; humerus, 22; tibia, 19; innominate, 19; skull, 19;
scapula, 12; fibula, 11; foot, 6; rib, 6; sacrum, 4; ulna, 3; radius,
3; clavicle, 2; head, 2; coccyx, 2; sternum, 1. The immunity
of the vertebræ is remarkable.

In the *connective tissue* the localities that most frequently
originated sarcomata (in 200 cases) were: Face, 20; neck, 20;
thigh, 18; leg, 13; orbit, 12; mediastinum, 11; peritoneum, 11;

[10] For further details of this kind vide Middlesex Hospital Surgical Report for
1888. London.

multiple, 10; nose, 10; groin, 8; retro-peritoneal, 8; arm, 7; shoulder, 7; scalp, 6; abdominal wall, 6; forearm, 5; hand, 4; popliteal space, 4; upper lip, 4; pelvis, 3; peri-renal, 2; muscle, 2; eyelid, 2; and 1 each as follows: foot, infra-clavicular, scapular, back, axilla, gluteal and ischio-rectal.

The *various organs* (in 324 cases) were affected as follows: Breast, 92; eye, 40; testis, 40; parotid, 32; ovary, 24; skin, 17; palate, 12; lymph gland, 12; kidney, 8; rectum, 7; bladder, 6; tonsil, 5; submaxillary, 4; lung, 3; prostate, 2; larynx, 2; pharynx, 2; vagina, 2; uterus, 2; and 1 each as follows: external ear, optic nerve, vulva, colon, thyroid, mouth, supra-renal, spinal meninges, tongue and brain.

The localities in which *myxomata* originated were noted in 29 cases: Thigh, 8, nearly all of the groin; parotid, 4; breast, 4; peri-renal, 2; and 1 each as follows: popliteal space, pectoral, loin, arm, testis, soft palate, naso-pharyngeal, pelvis, neck, finger and nose.

Fibromata.—Seventy-three per cent of all neoplasms of this kind arose from the uterus (of these 60% were myo-fibromas and 13% myxo-fibromatous polypi). Next in order came the maxillæ, 9.2%, including epulis, 8.8%; nasal fossæ, 5.3%; lower limb, 1.9%; external genitals, 1.3%; external auditory meatus, 1.2%; subcutaneous, 1.2%; painful tubercle, basis cranii, 1%; skin, 1%. The remaining 5% in order of relative frequency, were: Nerve, upper limb, trunk, head, larynx, bladder, neck, soft palate, tongue, rectum, trachea, ovary, tendon, multiple, heart and breast.

Lipomata.—Fatty tumors may be either *acquired* or of *congenital* origin, and it is important not to confuse the two varieties. The so-called *diffuse* lipomata, as I have shown[11] elsewhere, cannot be regarded as true neoplasms, and therefore will not be considered here. Similarly with many other so-called fatty tumors, such as *lipoma arborescens* of Müller, the numerous forms of *capsular lipoma*, the fatty deposits sometimes found in various neoplasms, myomas, cancers, sarcomas, etc.; all of these are but examples of abnormal fat deposition chiefly due to circulatory disturbances.

[11] Trans. Path. Soc. London. 1889.

Of 80 consecutive cases of true lipoma, 6 (or 7.5%) were *congenital*, and 74 (or 92.5%) *acquired*.

It is a peculiarity of *congenital* lipomas that they are usually deeply seated, adherent to adjacent parts such as bones, muscles, nerves, etc., which are sometimes malformed in consequence of their presence; and portions of these structures are not infrequently embedded in the tumor. The above mentioned six cases[12] were situated as follows: (1) At back of neck on right side beneath the muscles, which were deficient, and adherent to the periosteum of the occipital bone. (2) Gluteal region, right. (3) Clavicular region (right) adherent to clavicle and clavicular head of sterno-mastoid muscle, some muscular fibres passing right through the tumor. (4) Sacral region, firmly adherent to the periosteum of the sacrum. (5) Hand, right; a large encapsuled, lobulated tumor, situated beneath the muscles of the ball of the thumb, etc., some of which were deficient and adherent, the median nerve was embedded in the tumor, which was also adherent to several of the adjacent bones, though these were not obviously deformed. (6) Leg, right; two tumors adherent to the periosteum of the tibia.

Of 200 consecutive *acquired* lipomas, all but 5 were situated in the subcutaneous panniculus adiposus. These 5 cases were situated as follows: Beneath the pectoralis major muscle, 2 cases; beneath latissimus dorsi muscle 1 case; in the substance of the deltoid muscle 1 case; beneath the aponeurosis of the occipito-frontalis muscle 1 case. In 5 out of 190 cases there was more than a single tumor. In 5 out of 200 cases the tumor assumed a polypoid form; these tumors were situated thus: ischio-rectal region, 2; axilla, 1; gluteal region, 1; popliteal, 1.

Acquired lipomas originated in the following situations:

	Per Cent.	
Trunk	47.8	(Rather more than half situated posteriorly, chiefly in the lumbar and scapular regions).
Upper limb	27.8	(Chiefly in the deltoid, acromial and axillary regions).
Lower limb	12.2	(Thigh and gluteal regions chiefly).
Neck	8.4	(Most at back of neck).
Head	3.8	(Chiefly about the nose).
	100.0	

[12]Vide Middlesex Hospital Surgical Report for 1889.

Adenomata.—Of 505 consecutive cases, 73.6% originated in the breast; 12.6% in the parotid; 10.3% in the rectum (polypoid). Other localities were submaxillary gland, palate, sweat glands, lachrymal gland, septum nasi, uterus and face.

Papillomata.—Of 386 consecutive cases, meatus urinarius externus, 38.8%; skin, 26.7%, chiefly of the head; external genitals, not venereal, 15.5%; bladder, villous, 5.9%; tongue and mouth, 4.9%; lip, 2%; rectum, villous, 1.8%; other seats, anus, trachea and conjunctiva.

Osteomata.—Of 111 cases, terminal phalanx of great toe, subungual, 30.6%; femur, 16.2%; tibia, 11.7%; multiple, 9.9%; humerus, 9%; vertebræ, 4.5%; other seats in order of frequency were: superior maxilla, mastoid process, scapula, 5th metacarpal, innominate, ulna, external auditory process, metatarsal, terminal phalanx of middle toe, subungual (1 case only). The very frequent occurrence of the subungual exostosis, in every case but one situated on the terminal phalanx of the great toe, and nearly always on the inner side, is remarkable. These and other facts point to the probability of this lesion being but an abortive form of the lowest grade of digital duplicity.

Chondromata.—Of 72 cases, parotid, 37.5%; hand, 22.2%; long bones, 22.2%; superior maxilla, 2.8%; submaxillary, 4.8%; other situations, inferior maxilla, breast, testis, ischiorectal, lachrymal, toe, scapula, external ear and mediastinum.

Angiomata.—Of 94 cases, head, 55.3%; trunk, 21.3%; neck, 7.5%; external genitals, 5.3%; lower limb, 5.3%; upper limb, 5.3%.

Cystomata.—Of 1,640 cysts, *acquired*, 91.8%; *congenital*, 8.2%. Of *acquired* cysts the seats were:

	Per Cent.	
Ovary	48	(Of 216 ovarian cysts, 84.5 per cent originated in the ovary, and 11.5 in the broad ligament).
Sebaceous	29.2	(Two-thirds of the scalp.)
Spinal cord and round ligament	5.2	
Breast	4.1	
External genitals	4	
Dental (alveolar)	1.9	
Testis	1.5	
Floor of mouth (ranular)	1.4	
Thyroid	1.0	

Other situations, peri-articular, neck, parotid, thigh, kidney, omentum, cerebellum, uterus, pelvis, groin, post-peritoneal, lip, loin, liver, humerus, finger.

Of *congenital* cysts, dermoid, 92.3%; serous, 7.7%. The seats of the dermoid cysts were, head, 41.6%, more than half of the orbital region; ovary, 35%; neck, 17.3%; other situations, thigh, scrotum, sternum, peritoneum.

I will now conclude with a few remarks as to the *influence of sex* on the liability to neoplasms. On reference to Table I, it will be seen that the liability of females to neoplasms is about twice that of males. Of 15,481 cases there tabulated, 5,191 are males and 10,290 females; or the percentage proportion is about 33 males to 67 females. This striking difference is entirely due to the great frequency with which, in females, the breast, uterus and to a less degree, the ovary, are attacked, the corresponding male organs seldom suffering. Omitting these, the male liability would preponderate in a very decided manner. In females 69% of *all neoplasms* attack the reproductive organs (uterus, breast, ovary and external genitals); in males, only about 11%.

Of 7,878 cases of epithelioma (cancer), 2,861 were males and 5,017 females, the proportion being 1 male to 1.7 females. According to the mortality returns of the Registrar General, which include all kinds of malignant disease, the proportion is 1 male to 2.28 females.[13] Of late this distinction has become less pronounced, owing to the increasing cancer mortality falling unduly on males; for instance the cancer mortality for 1886 is 5,754 males, and 10,489 females, or, 1 male to 1.8 females.

Rodent ulcers are pretty equally distributed between the sexes. Of 177 cases, males 98, females 78. In females, 78.2% of all *cancers* attack the reproductive organs, in males only 8.4%.

The relative liability of each sex to cancer in particular organs is very variable. For every case of cancer of the prostate, there occur 224 cases of uterine cancer, and for every

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[3] Vide The Influence of Sex in Disease, by the author of this essay. London. Pages 8 and 15. The mortality returns referred to are for the 25 years from 1848 to 1872.

case of cancer of the male breast, 116 of the female breast. In all other situations, except the sexual glands (ovary and testis), liver, rectum and intestines, where both sexes are equally liable, the male proclivity to cancer greatly exceeds the female. In the lower lip it is 108 times as great, in the tongue and mouth 7 times, in the œsophagus 1.7 times, and in the external genitals 1.2 times.

Of 1,350 cases of *sarcoma*, there were 702 males to 648 females. In females, 23.4% of all sarcomas attack the reproductive organs; in males, 8.6%.

Myxomas like sarcomas are nearly equally distributed between the sexes.

The liability of females to *non-malignant* neoplasms as compared with males, is even greater than their liability to cancers. Of 4613 cases in Table I, there were 1,179 males to 3,434 females; or 1 male to 2.9 females. This excessive female liability is largely due to the same causes we have seen with regard to cancer, viz.: the frequency with which the breast (377 cases) and uterus (1,073 cases) are involved. Omitting these, however, the female proclivity to non-malignant neoplasms would still largely preponderate over that of males. Almost every kind of non-malignant neoplasm is, in fact, of much commoner occurrence in the female sex. To *fibromas* they are 9 times as prone as males, to *adenomas* 8 times, to *lipomas* more than twice, and to *papillomas* nearly twice.

The relative female liability to *cysts* is nearly as great as that to non malignant neoplasms; of 1,640 cysts, males 449, females 1,191; or 1 male to 2.6 females. This preponderance of females is entirely due to the frequency of *ovarian cysts* (752 cases). Omitting these, each sex would be about equally liable.

TABLE I.—SHOWING THE RELATIVE FREQUENCY OF THE DIFFERENT VARIETIES

OF NEOPLASMS.

Kind of Neoplasm.	Total Number of Cases.	Males.	Females.	Percentage. Males.	Females.	Appendix.
Epithelioma,[1] . . .	7878	2861	5017	36	64	
Sarcoma,[2]	1350	702	648	52	48	[1]Synonymous with cancer.
Fibroma, ...	1661	176	1485	10	90	[2]Including 50 cases of myxoma
Lipoma, ...	561	173	388	31	69	(M. 25, F. 25), and 24 of keloid (M. 11, F. 13).
Adenoma, ...	505	58	447	11	89	[3]Single cysts, 1505 (M. 392, F.
Papilloma, ...	286	137	249	35	65	1113); congenital cysts, 135 (M. 57, F. 78).
Osteoma, ...	261	117	144	45	55	[4]Cerebral, 248 (M. 135, F. 113);
Chondroma, . . .	81	41	40	51	49	cerebellar 39, (M. 22, F. 17); spinal cord 6, (M. 3, F. 3);
Angioma, ...	157	65	92	41	59	mediastinal 109, (M. 73, F. 34); cutaneous mole 36, (M.
Cystoma,[3]	1640	449	1191	27	73	12, F. 24); teratoma 4, (M. 3, F. 1). (Probably but a
Neoplasms unclassified,[4]	1001	412	599	41	59	small proportion of these so-called "cerebral tumors" were true neoplasms.
Total, . . .	15481	5191	10290	33	67	

TABLE II.—SHOWING THE INITIAL SEATS OF NEOPLASMS AND THEIR FREQUENCY
IN BOTH SEXES.

Seat.	Epithelioma.	Sarcoma.	Fibroma.	Lipoma.	Adenoma.	Papilloma.	Osteoma.	Chondroma.	Angioma.	Cystoma.	Unclassified.	Total.
Uterus, ...	1571	2	1073[1]		1					2		2649
Breast, ...	1879	99[2]	1[3]	2	372	3		1	1	64		2422
Skin, ...	559	17	16		3[4]	98			140	440[5]	36[6]	1309
Connective tissue, .		330[7]	98	558						85		1071
Tongue and mouth, .	804	15[8]	3[9]		4[10]	19[11]			8	57[12]		880
Ovary, ...	27	24	1							752[13]		804
External genitals, .	340	3	19			208[14]				141		712
Bones (except maxilla)	14	236[15]	15				256	35		1		557
Rectum, ...	401	7	1		52	6						467
Maxilla, superior.	70	102	136[16]				3	2		29		406
Maxilla, inferior.	13	38					2	1				
Stomach, ...	352								6	1		352
Lip, ...	332	4	1			8				1	287[17]	352
Brain, ...	1	1								1		290
Liver, ...	228											229
Œsophagus, . . .	179									7		179
Parotid, ...	2	36[18]			64[19]				27		107	136
Mediastinum, . . .	15	11							1			134
Intestine, (except rectum and anus, .	98	1[20]							1	107		99
Testis, ...	27	41[21]										93
Bladder, ...	59	6	2			23						90
Nasal fossa, . . .		1	78[22]		1							80
Lymphatic glands, .	59	12										71
Peritoneum, . . .	54	11										68
Larynx.	38	2	6			13						39
Eye, ...	1	40	2			1			1			45
Ear, (external) . .	13	1[23]	19[24]			2			1	1		37

TABLE II.—CONTINUED.

Seat.	Epithelioma.	Sarcoma.	Fibroma.	Lipoma.	Adenoma.	Papilloma.	Osteoma.	Chondroma.	Angioma.	Cystoma.	Unclassified.	Total.
Kidney, ...	24	8								2		34
Anus, ...	27					2[35]						29
Thyroid, ...	7	1								15		23
Pancreas, ...	21											21
Tonsil, ...	13	5										18
Lung, ...	14	3								2		17
Submaxillary gland,	4	4			5			2				17
Pharynx, ...	14	2										16
Pelvis, ...	10	4[26]								1		15
Gall-bladder, . . .	11											11
Prostate, ...	7	2										9
Spinal cord, . . .		1									6	7
Urethra, ...	1					2						3
Pleura, ...	3											3
Trachea, ...			1			1						2
Pericardium, . . .	2											2
Lachrymal gland, .					1				1			2
Spleen, ...	1											1
Suprarenal body, .		1										1
Coccygeal gland, . .	1											1
Abdominal wall (not skin), ...	1											1
Heart, ...			1									1
Total, . . .	7297	1081	1473	560	5c3	386	261	72	157	1598	436	13824
Unclassified, . . .	581	269	188	1	2			9		42	565	1647
Grand total, .	7878	1350	1661	561	505	386	261	81	157	1040	1001	15481

TABLE III.—SHOWING THE INITIAL SEATS OF NAOPLASMS AND THEIR RELATIVE FREQUENCY IN MALES.

Seats.	Epithelioma.	Sarcoma.	Fibroma.	Lipoma.	Adenoma.	Papilloma.	Osteoma.	Chondroma.	Angioma.	Cystoma.	Unclassified.	Total.
Skin, ...	370	7	6		1[1]	56			57	247[2]	12[3]	756
Tongue and mouth, .	703	6[4]			1[5]	11[6]			3[7]	7[8]		731
Connective tissue, .		183[9]	28	172						50		933
Lips, ...	327[10]	2[11]				4			4[12]			337
External genitals, .	182[13]		2			31[14]				67[15]		282
Bones (except maxilla)	7	134[16]	8[17]				114	17		1		281
Rectum, ...	199	5	1		16							231
Stomach, ...	222											222
Maxilla, { superior.	42	53	20[18]				2	1		17		180
Maxilla, { inferior.	12	31					1	1				
Brain, ...		1								2	157[19]	159
Œsophagus, . . .	144											144
Liver, ...	115											175
Testis, ...	27	41[20]						1		24		93
Mediastinum, . . .	11	7									73	91
Bladder, ...	43	5	1			21						76
Parotid, ...	2	18[21]			26				14	3		63
Intestine (except rectum and anus, . .	49	1[22]										50
Larynx, ...	34	2	4			9						49
Lymphatic glands, .	33	10										43
Nasal fossa, . . .		1	31[23]		1							33
Peritoneum, . . .	20	8								1		29
Breast, ...	16	5[24]		1	1				1	1		25
Kidney, ...	17	3								1		21
Eye, ...		20										21
Ear (external), . .	11	1[25]	6[26]			2						20
Anus, ...	17					1						18

TABLE III.—CONTINUED.

Seats.	Epithelioma.	Sarcoma.	Fibroma.	Lipoma.	Adenoma.	Papilloma.	Osteoma.	Chondroma.	Angioma.	Cystoma.	Unclassified.	Total.
Pancreas, ...	14											14
Tonsil, ...	9	5										14
Lung, ...	10	3										13
Thyroid, ...	4									9		13
Submaxillary gland,	4	4			1			1		2		12
Prostate, ...	7	2										9
Pharynx, ...	7											7
Gall-bladder, . . .	5											5
Urethra, ...	1					2						3
Spinal cord, . . .											3	3
Pelvis, ...	1											1
Pericardium, . . .	1											1
Spleen, ...	2											1
Lachrymal gland, .								1				1
Suprarenal capsule, .		1										1
Coccygeal gland, . .	1											1
Abdominal wall (not skin), ...	1											1
Heart, ...			1									1
Total, . . .	2669	559	109	172	57	137	117	36	65	31	245	4597
Unclassified, . . .	192	143	67	1	1				5		18	167	594
Grand total, .	2861	702	176	173	58	137	117	41	65	449	412	5191

TABLE IV.—SHOWING THE INITIAL SEATS OF NEOPLASMS AND THEIR RELATIVE FREQUENCY IN FEMALES.

Seats.	Epithelioma.	Sarcoma.	Fibroma.	Lipoma.	Adenoma.	Papilloma.	Osteoma.	Chondroma.	Angioma.	Cystoma.	Unclassified.	Total.
Uterus, ...	1571	2	1073[1]		1					2		2649
Breast, ...	1863	94[2]	1[3]	1	371	3			1	63		2397
Ovary, ...	27	24	1							752[4]		9´4
Connectiue tissue, .		147[5]	70	386						35		638
Skin, ...	189	10	10		2[6]	42			83	193[7]	24[8]	553
External genitals, .	158[9]	3[10]	17[11]		1	167[12]				74[13]		430
Bones (except maxilla)	7	102	7[14]				142	18				276
Rectum, ...	202	2			26[15]	6						236
Maxilla, { superior.	28	49	116[16]				1	1		12		226
Maxilla, { inferior.	1	17							1			
Tongue and mouth,	101	9[17]	3[18]		3[19]	8[20]			5	20[21]		149
Brain, ...	1[22]										130[23]	131
Stomach, ...	130											130
Liver, ...	113									1		114
Parotid, ...		18[24]			38[25]			13		4		73
Intestine (except rectcm and anus, . .	49											49
Nasal fossæ, . . .			47[26]									47
Mediastinum, . . .	4	4							1		34	43
Peritoneum, . . .	34	3								2		39
Œsophagus, . . .	35											35
Lymphatic glands, .	26	2										28
Eye, ...	1	20	1			1			1			24
Bladder, ...	16	1	1			2						20
Ear (external), . .	2		13z[7]						1	1		17
Lips, ...	5[28]	2[29]	1[30]			4[31]				2[32]		15

TABLE IV.—CONTINUED.

Seats.	Epithelioma.	Sarcoma.	Fibroma.	Lipoma.	Adenoma.	Papilloma.	Osteoma.	Chondroma.	Angioma.	Cystoma.	Unclassified.	Total.
Pelvis, ...	9	4[33]								1		14
Kidney, ...	7	5								1		13
Anus, ...	10					1[34]						11
Larynx.	4		2			4						10
Thyroid, ...	3	1								6		10
Pharynx, ...	7	2										9
Pancreas, ...	7											7
Gall-bladder, . . .	6											6
Submaxillary gland,					4				1			5
Spinal cord, . .		1									3	4
Lung, ...	4											4
Tonsil, ...	4											4
Pleura, ...	3											3
Trachea, ...			1			1						2
Lachrymal gland, .					1							1
Pericardium, . . .	1											1
Total, . . .	4628	522	1364	388	446	249	144	36	92	1167	191	9227
Unclassified, . . .	389	126	121		1			4		24	398	1063
Grand total, .	5017	648	1485	388	447	247	144	40	92	1191	589	10290

Notes to Table II.

1. Myofibroma, 883; **myxofibroma (polypoid)**, 190.
2. Myxoma, 4.
3. The fibro-adenomas are classed with the adenomas.
4. Of sweat-glands.
5. Sebaceous.
6. Moles.
7. Myxoma, 22.
8. Palate, 12; tongue, 1; mouth, 1: myxoma, 1.
9. Palate, 2; tongue, 1.
10. Palate.
11. Tongue, 8; palate, 8; mouth, 5; gums, 1.
12. Ranula, 22; dermoid, 5.
13. Ovarian, 635; broad ligament, 87; dermoid, 30.
14. Non-venereal.
15. Myxoma, 1.
16. Epulis, 130.
17. Cerebral, 248; cerebellar, 33. (Probably only a small proportion of truly neoplastic origin).
18. Myxoma, 4.
19. The fibro-adenomas are classed with the adenomas.
20. Colon.
21. Myxoma, 1.
22. Polypoid myxofibromas.
23. Melanotic.
24. Aural polypi, 14.
25. Non-venereal.
26. Myxoma, 1.

Notes to Table III.

1. Of cutaneous sweat gland.
2. Sebaceous.
3. Moles.
4. Tongue, 1; mouth, 1; palate, 4.
5. Palate.
6. Tongue, 5; soft palate, 3; roof of mouth, 2; gum, 1.
7. Tongue, 1; mouth, 2.
8. Ranula, 6; dermoid, 1.
9. Myxoma, 14.
10. Upper lip, 1.
11. Both of upper lip.
12. Lower, 3; upper, 1.
13. Penis, 106; scrotum, 76.
14. Non-venereal.
15. Spermatic cord, 66; dermoid of scrotum, 1.
16. Myxoma, 1.
17. Basis cranii, nasopharyngeal polypi.
18. Epulis.
19. Cerebral, 135; cerebellar, 22.
20. Myxoma, 1.
21. Myxoma, 3.
22. Colon.
23. Polypoid myxofibromas.
24. Myxoma, 2.
25. Melanotic.
26. Aural polypus.

Notes to Table IV.

1. Myofibroma, 383; myxofibroma (polypoid), 190.
2. Myxoma, 2.
3. The fibro-adenomas are classed with the adenomas.
4. Ovarian, 635; broad ligament, 87; dermoid, 30.
5. Myxoma, 8.
6. Cutaneous sweat glands.
7. Sebaceous.
8. Moles.
9. Vulva, 104; nympha, 6; clitoris, 7; symphisis pubis, 1; vagina 40.
10. Vagina, 2; vulva, 1.
11. Labia maj., 12; lab. min., 2; vagina, 3.
12. Urethral caruncle, 148; the others non-venereal.
13. Ext. genitals, 61; round ligament, 13.
14. Basis cranii.
15. Polypoid.
16. Epulis, 110.
17. Palate, 8; myxoma, 1.
18. Palate, 2; tongue, 1.
19. Palate.
20. Tongue, 3; soft palate, 1; vulva, 1; mouth, 3.
21. Ranula, 16; dermoid, 4.
22. Cerebral, 113; cerebellar, 17.
23. Dura mater.
24. Myxoma, 1.
25. The fibro-adenomas are classed with the adenomas.
26. Polypoid myxofibroma.
27. Aural polypus.
28. Lower lip, 3; upper lip, 2.
29. Upper lip, 2.
30. Lower lip.
31. Upper lip, 1.
32. Upper lip, 2.
33. Myxoma, 1.
34. Non-venereal.

DRAINAGE OF WOUNDS, WITH SPECIAL REFERENCE TO DRAINAGE AFTER URETHROTOMY.[1]

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DRAINAGE in the treatment of wounds has been used from a very early day, but its estimated value has received more marked attention in modern times in connection with general antiseptic treatment. And yet opinion still fluctuates in regard to the need of this means as a portion of the technique of modern wound treatment.

The practical surgeon of large experience must occupy a safe middle ground in the discussion of the value of drainage *per se*. The most tenable position is that which holds that every wound must be treated as a unit to secure the best results, and have the patient subjected to the minimum amount of danger.

Safety from local and general infection and certainty of union *per primam* are the chief considerations held in view. The latter result, though generally desirable, is, however, never to be sought at the risk of encountering the former. The time was when to escape the fearful danger of infection, the surgeon entirely ignored the advantages of primary union. The open treatment of wounds was then the fashion; but to-day this is practiced only in exceptional cases. Stuffing the wound spaces, or interposing at least some substance to prevent contact of surfaces; the rejection altogether of wound dressing, or the substitution of some slight protection for the

[1]Read at the meeting of the South Carolina Medical Association, June, 1891.

layers of charpie smeared with cerate, as used in the French hospitals thirty years ago; or the heavy compresses of cotton used elsewhere to occlude the wound; the total abandonment of sutures and adhesive strips for accurately closing wounds, and the resort to *debridement* of deep wounds—were a few of the methods which then took the place of modern plans for effecting drainage.

Primary union was, by one or other of these means, rendered almost impossible, but notwithstanding this, secretions and exudates were not effectually disposed of, and infection or sepsis was by no means prevented.

This was before the introduction of the germ theory, or the study of bacteria or phagocytes—before Listerism attracted attention or threatened, as it has done, to revolutionize surgical doctrines and treatment.

The danger resulting from the retention of blood and inflammatory secretions, as well as the subsequent putrescency of these materials, was fully recognized. The necessity for the escape of blood, serum, lymph and pus was admitted.

By preventing primary union, making free openings in the tissues, and utilizing the principle of gravity, the proper indications for treatment were to a fair extent carried out. Wounds of natural cavities were known to be extra dangerous, and the closed spaces of wound surfaces were looked upon as cavities upon a small scale, and dangerous because of their capacity for retaining secretions or exudates.

Another fact was fully recognized, viz., that subcutaneous wounds enjoyed freedom from infection.

Where no air entered, no decomposition or sepsis was feared, and no pus was looked for.

Still, the entrance of a living germ was not regarded as necessary to the formation of pus.

When, finally, Listerism came with its germ theory, as associated with infection, it did not pretend to disregard many of the old principles of treatment. It accepted many of the views to which I have briefly referred. But with the old knowledge it introduced a new factor to explain much that was obscure. It accepted the drainage of wounds as one of the most important features of treatment, but this simply because all

wounds were not subcutaneous in character. It announced the great importance of excluding germs from without; no germs, no decomposition, no putrescence, no infection, no suppuration, as a rule.

But Listerism did not insist upon the doctrine, no suppuration without bacteria. If this latter be true it is an advance beyond what Lister claimed.

With free drainage, as practiced in our own times, we can insist that the ingress of germs, or their lodgment, is improbable and uncertain. And, further, it is comforting to believe that all micro-organisms found in the tissues are not potent for evil. Primary union and the absence of infection are often noticeable where bacteria have had ingress, or where they have been purposely introduced. Dangerous germs are at times controlled or destroyed by leucocytes that pertain physiologically to the parts. The war of cells, then, must not be forgotten as one of the possible contingencies which may assist the surgeon.

However, the conservative surgeon, in the face of the recognized facts referred to, must prefer to exclude the possibility of the entrance of germs, while he provides specially for the escape of exudates.

Further, he prefers in the treatment of wounds to guard against all chances of decomposition within the wound, to make use of agents known to be inimical to germ life, and to use as dressings materials which will act as barriers to the ingress of all germs from without.

Accepting even the doctrine of phagocytosis, or the ability of some cells to absorb and digest microbes, he need not, because of a specious theory, jeopardize the safety of his patient.

This scheme of treatment, together with the necessary prevention of further traumatism by proper rest and protection, may be said to constitute modern Listerism.

There may be differences of opinion as to the real value of the several factors going to make up the ideal treatment, but this does not detract from its value as a method promising good results.

The above remarks, though properly pertaining to the subject of wound drainage in general, are especially pertinent to

the subject of drainage in connection with the operation of urethrotomy.

We have in connection with such operations a narrow and tortuous canal, not strictly uniform in calibre, but physiologically narrower at regions; connected anatomically with surrounding and contiguous structures which present complications when suffering from the effects of lesions; related to muscles, blood vessels and nerve tissue which, under associate injury, or sympathetic disturbance, give at times serious results, or afford predominant symptoms to be duly recognized if treatment is to be successful.

This canal is a conduit, too, for an important secretion which in traumatisms becomes a most important factor in determining the results which are to follow.

The commingling of this secretion, either in its physiological or pathological condition, with the blood or inflammatory products, or with foreign germs which may occupy regions of the canal, or its entrance into spaces created through traumatisms, may at once determine the issue which decides the fate of the individual. It must not be supposed, however, that we are disposed to regard the many serious consequences that are reported to have followed urethrotomies as always attributable to conditions which drainage is capable of obviating. The peculiar nervous arrangement of the deep part of the urethra and the prostatic region, or neck of the bladder, we regard as often responsible for serious symptoms, and sometimes for death.

These results can at times be explained in no other way; but we are perfectly justifiable, however mortifying it may be from a scientific standpoint to say so, to speak of nervous sympathy, reflex irritation and disturbance of the sympathetic system, in connection both with slight and grave conditions encountered.

The passage of a catheter or bougie will, in some instances, be followed by a severe chill, by syncope or by convulsions, and, later, by bloody urine, or by the total arrest of urinary secretion, or by rise of temperature and other signs of acute pyrexia. Independent of the nervous connection, however, there may be serious hæmorrhage, and the blood may flow

either toward the meatus and there escape, or backward and
enter the bladder. Wounds of the bulbo-membranous region
are often followed for many days by bloody urine. There
may be both clotted and fluid blood mixed with the urine, and
at times the bladder fills to such an extent with blood clot that
it cannot be properly emptied even by the use of the catheter.
Clots lodge likewise in the wounds, and decomposition may
occur in the bladder and outside of it. The admixture of un-
healthy urine with blood and inflammatory exudates almost
certainly generates a poisonous material, and now may rapidly
supervene all the marked symptoms of septicæmia, sapræmia
or pyæmia. Bacteria soon abound, and whether introduced
from without, through the meatus, or reaching the bladder and
deep wounds by other channels of entrance, they play the im-
portant role which compels us to associate them with the fear-
ful casualties so long known to surgery. All parts of the
urethral canal are not, however, alike susceptible, or to the
same extent responsible for the development of serious disease.
The deeper the site of the lesion, as regards the length of the
canal, perhaps the greater the likelihood of there being devel-
oped the serious pathological conditions to which I have re-
ferred. Wounds at the meatus rarely give trouble in this way.
The pendulous, or penile portion, of the canal readily drains
toward the meatus. The uninterrupted flow of healthy urine
will serve to remove clots, and tend to keep all anterior wounds
free from noxious elements likely to occasion infection. With
the presence of diseased urine, however, even the anterior por-
tion of the canal may enjoy no immunity from sepsis, and the
deeper portion affords constant evidence of the serious nature
of lesions under these adverse conditions. Internal urethrot-
omy of the deeper part of the canal can hardly be regarded, in
the light of modern knowledge, as a warrantable operation.

It becomes, then, a practical question whether drainage can-
not obviate these serious calamities connected with urethrot-
omy, how it can be used to the best advantage, and in what
kinds of urethral operations it is most imperatively demanded.

Both drainage of the bladder and drainage of the urethral
canal must be considered in this inquiry, and under the con-
ditions both of physiological and pathological states of the

urinary secretion. We need not stop to remark upon what constitutes unhealthy urine, and the means of determining its existence.

The character of the urine, so far as it concerns the surgeon, in regard to its probable effect upon urethral wounds, may be easily ascertained by inspection, by its odor, its viscidity, its specific gravity, or by its behavior under proper chemical and microscopical examination. But the proper rule for the surgeon to observe in dealing with all urethral lesions is to err on the safe side, and protect in all cases against the possibility of an abnormal secretion. Fortunately we have modern means at our disposal, capable of quickly modifying many morbid conditions of the urine. In boracic acid, salol, saccharine and other articles, we have valuable adjuvants to the common surgical resources. Drainage of the bladder is all that can be desired when the natural expulsive powers of the organ are intact, when there is, of course, no paralysis, no dilatation, no sacculated condition, no thickening of its walls; no cystitis, no obstruction at the neck, and no narrowing of the urethral canal.

With healthy urine, physiologically expelled, there is no serious apprehension to come from lodgment or detention of the secretion after urethrotomies of the penile portion of the canal. The natural passage of healthy urine will, on the contrary, as already suggested, serve to protect from many dangers. Blood clots are washed out, inflammatory secretions are diluted and removed; pathogenic bacteria are not permitted to lodge and germinate. The natural drainage of the bladder, then, is the best drainage when we are assured of the healthy state of the urine. The only question is, whether we shall always admit the healthy condition of the secretion, or whether it is safer to assume that it is not healthy, and to protect the urethral wound accordingly; in other words, whether we should not always drain the bladder artificially and prevent any contact of urine with the wound?

In determining this question we must not forget to estimate the probable injurious effect upon the wound of the use of even the most improved instruments for artificial drainage. This drainage is accomplished by the use of the catheter, which must pass the entire length of the canal to reach the

bladder.   Then, this must be allowed to remain in position, or
it must be withdrawn and again introduced as many times a
day as may be necessary.   In either instance the wound is ir-
ritated and the procedure painful.   Then the retained catheter
becomes, sooner or later, obnoxious to the bladder, and pos-
sible complications may arise from persisting in its use.

Drawing off the urine from time to time almost certainly in-
sures the frequent contact of the secretion with the wound, no
matter how carefully the catheter is used.

Neither is a third plan, often resorted to, viz., retaining the
catheter in the canal with the eye just anterior to the neck of
the bladder, and only urging it onward into the cavity when it
is desired to drain off its contents, any less objectionable.

The larger our experience, the less satisfied have we become
with the use of the catheter *à demeure*.   No matter how well it
be secured it is liable to be misplaced, accidentally, or by the
efforts of the patient.   The soft rubber catheter generally
used, will, in time, under the irritable action of the bladder, be
doubled up so that the beak emerges from the cavity and
some urine, of necessity, escapes with it.

We subject the patient to all the annoyances of the instru-
ment, and we encounter the very evils that it was our object
to avoid.

When the catheter *a demeure* is resorted to, however, we
always prefer the old stiff, English, elastic instrument, now but
seldom used.   It can be better secured at the meatus, and it
is much less likely to double up or to protrude from the cav-
ity under the contractions of the organ.   Anodynes, internally
or by the rectum, will help to quiet the bladder and better in-
sure the retention of the catheter.   But in all cases of ureth-
rotomy of the penile portions of the canal, our preference is
for natural drainage of the bladder and of the canal, and the
rejection of the catheter.   The urine I try to modify in advance
by the use of salol, boracic acid, citrate of potash, etc.   The
bladder is also, when necessary, treated in advance by suitable
injections.   After this the urethrotomy is done and the patient
allowed to urinate by the natural way.

In cases of undue hæmorrhage a large sized English cathe-
ter is tied in for 24 or 48 hours, and then removed.   Where

the catheter *a demeure* is used, of course drainage of the wound and the urethral canal goes on outside of the wall, and this may be all that is necessary. Where no catheter is employed there is the opportunity, which I always embrace, of washing out the canal by the meatus, several times a day, with Thiersch's or some other unirritating, antiseptic solution.

Internal urethrotomy, as practiced upon the deep urethra or any portion at or posterior to the bulbo-membranous junction, must always give rise to much greater solicitude than the operation on the anterior portion of the canal. Here, drainage of the bladder alone is not the important question. The drainage of the canal from the site of the wound is the chief consideration, but at the same time, the bladder has to be drained as in the anterior operation, and even more care should attach to protecting the wound from the contact of urine. Natural drainage cannot be trusted to, for this is not necessarily efficient. The flow of blood and inflammatory secretions is as likely to be backwards, to the bladder, as forward to the meatus. The natural relation of all the parts is such, that drainage in either direction is uncertain, and lodgement of products is likely to obtain. We have then the very conditions favorable to sepsis and local and general infection. Infiltration of urine, too, is one of the serious evils to be apprehended, and so is hæmorrhage.

Where such operation is practiced, surgeons are almost uniformly of opinion that a catheter should at once be passed into the bladder and retained for 24 or 48 hours. This is to guard from hæmorrhage and from urinary infiltration, as well as to protect the wound from the effect of urine, which is by many regarded as injurious in its effects even in its normal condition. Drainage goes on, of course, only along the outer wall of the retained catheter. But is this efficient, and is it safe to trust to so imperfect a method? We would not so regard it in case of more open and superficial wounds when we thought drainage necessary. Tubular or capillary drainage, in such cases, we would regard as necessary. The capillary drainage outside of the catheter, and from so deep a wound, is surely most imperfect.

From what we have already said upon the use of the catheter

for bladder drainage in anterior urethrotomy, it will be seen that we can place no reliance upon it here. We have learned this to our sorrow. What surgeon has not had the experience that I have had, in visiting the patient the first or the second day after operating and learning that the beak of the catheter has been many times in and out of the bladder or that the instrument had doubled on itself and escaped during the night. The most intelligent patient cannot be made to realize the danger of the escape of the instrument, and all that he will do, is to push the instrument back when he finds that it has escaped or shows a tendency to escape, from the bladder. A conscientious nurse will serve no better purpose.

Experience has thus led me to believe that internal urethrotomy in the deep portion of the canal is an unsafe operation. The parts cannot be drained except by a direct perineal opening. Such operation, then, should be rejected unless it be followed by the counter opening through the perineum. The distinction has been made by some, and external urethrotomy separated from what has long been called, perineal section. This is hardly necessary and can have reference simply to the external division of parts being in the one case somewhat anterior to the usual site of the perineal wound. We prefer to say that perineal section should take the place of internal, deep, urethrotomy. The comparative ease in the performance of the respective operations and the other arguments in favor or against such procedure, we do not desire here to discuss. Our present argument against the operation of deep internal urethrotomy, and our preference for perineal section, rests simply upon the question of efficient drainage. This is impossible in one operation, but can be made most efficient in the other.

As to the mode of operating, with or without a guide, we have nothing to do. We only urge, that if the deep internal contractions of the canal is divided by the urethrotome, there should be as well an external free incision. Through this incision both the bladder and the deep part of the canal should be drained.

But how is this to be best accomplished? The usual plan has been to drain simply by the retained catheter as after in-

ternal urethrotomies. That is, convey the urine away by the catheter and allow the wound and the urethral canal to drain outside of the walls of the retained instrument. This, I regard, as unsatisfactory and unsafe. The necessity of artificially draining the bladder, I would urge only in cases where the urine is abnormal. Under other circumstances the patient may be allowed to urinate voluntarily, the escape, of course, being through the perineal wound. Where the bladder is to be drained, this should be by means of a short catheter, or tube, passing through the perineal wound to the bladder as after some lithotomy operations. This tube should be sufficiently rigid so as to be incompressible and not capable of being doubled up by the contractions of the organ. It may be of rubber, or of silver, of large calibre. It is best secured at the perineal wound by a strong silk suture passed through the cutaneous structures. More important than the drainage of the bladder is the thorough drainage of the urethral canal.

If more than one stricture has been divided, as is generally the case when perineal section is required for a deep contraction, the greater the necessity of this drainage of the entire canal. The plan I adopt is to pass a full sized tube, having velvet-eyed perforations, through the canal, from the meatus to the perineal wound. It must be long enough to project through both apertures. The perineal end of the tube is secured to the tegumentary wound by a silk suture, just as with the tube coming from the bladder. All fluids now pass readily from the canal; none can be detained in the deep portion. If there be hæmorrhage, the blood will appear externally and not pass back into the bladder. Further, by means of a syringe, the entire canal can be well washed out from time to time with a non irritating, antiseptic, fluid.

This practice I have now resorted to for a great many years. Although in the earlier part of my professional life, when adopting other plans generally in use, I had the misfortune several times to meet with fatal results after internal urethrotomy and frequently to encounter the most alarming symptoms, since appreciating the principles and adopting the practice here briefly outlined, the results have been all that could be desired.

The following conclusions may be thus formulated:

I. Urethrotomies for strictures of the penile portion of the urethra, including the meatus, require no artificial drainage.

In case the urine is healthy the natural passage of this is sufficient to prevent lodgement of blood or inflammatory exudates and subsequent decomposition, putrescency and sepsis.

II.   To insure against the action of unhealthy urine the secretion must be modified before resort to operation, by the use of proper medicinal agents, known to be efficient for this end.   The bladder must also be treated, as preliminary, when its condition is such as to furnish diseased elements which give deleterious character to the urine.

III.   If deemed necessary further to guard against the noxious character of the urinary secretions, the catheter *a demeure* must be resorted to for draining the bladder for 48 to 72 hours.   The rigid English gum catheter is to be preferred to the soft rubber one, as less likely to be displaced.

IV.   After internal urethrotomies of the deep portion of the urethra, drainage is most essential.   This cannot be properly secured by the mere use of the catheter, and, therefore, it is best to abandon such operation, and to substitute for it a perineal section, or external urethrotomy.

V.   After this latter operation, drainage goes on securely because of the direct external opening.   It should, however, be more thoroughly insured by a *perforated* drainage tube, reaching from the meatus, and made to project through the perineal wound; this is to be kept in place from 3 to 5 days.

VI.   Bladder drainage, after perineal, is not essential if the urine is healthy.   By the voluntary efforts of the patient the urine flows readily from the bladder, and escapes through the perineal wound.

VII.   To better insure the escape of urine, however, through the perineal wound, and also prevent its contact with all lesions of the canal, a short tube, of large calibre and rigid walls, may be passed into the bladder from the perineal wound, and kept in position by a suture passed through the tegumentary edge of the wound.   This tube may be removed after three days.

VIII.   The use of non-irritating, antiseptic injections through the tube occupying the canal, furnishes an additional precaution against sepsis.   The bladder may also be easily washed out by means of the tube used for draining it through the perineum.

LAPAROTOMY FOR GUNSHOT WOUNDS OF THE ABDOMEN, WITH REPORT OF A RECENT SUCCESSFUL CASE.

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MAY 21, 1885, I performed the first laparotomy for gunshot wounds of the abdomen in the Northwest.[1]

In the address which I delivered before the Minnesota State Medical Society, in the same year, I predicted that the time would come when the "do nothing and opium" treatment would be a thing of the past. How well fulfilled that has been is amply shown in the literature of our day. There is and there should be no other treatment for gunshot wounds of the abdomen than the surgical treatment, and the results, even in the hands of operators who are not recognized as masters, will be far better than the old-fashioned way of letting patients die without attempting to do anything for them.

The experiments of the late lamented Parkes, followed by those of Senn, have done a great deal to stimulate the profession into action in the treatment of those almost universally fatal cases. With the improved technique of intestinal surgery of our day the operation is not near as formidable as it used to be. In the hands of experienced operators—and none can become experienced unless they practice on animals and practice frequently and repeatedly—intestinal resection can be performed in from five to ten minutes, thereby saving time and preventing shock, which, with the old method, was such a great factor in causing death.

In no operation performed on the abdominal cavity is it necessary to be so careful and watchful as in the operations undertaken for the relief of the damages done by bullets, and

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[1]Northwestern Lancet, Vol. 4, page 377, 1885.

(289)

in none is it more necessary to have had experience so as to recognize the lesions, not only of the intestines, but of the omentum, and of the organs contained in the abdominal cavity, for here the least little wound in the mesentery or omentum overlooked and neglected may render all one's efforts and well done resections useless, and cause death from hæmorrhage in a short time.

I do not agree by any means with McGraw[2] that in seeking for wounds of the intestines it is not necessary to eviscerate the patient, but examine the bowel by slipping it through the hand. I say it is impossible in certain cases—and I have had a large experience in experiments upon the lower animals—I say it is impossible in certain cases to determine the perforation of a wound of the mesentery and omentum without examining it thoroughly, and examining it outside of the abdominal cavity. An experienced operator can examine the whole intestinal tract very quickly and very thoroughly without exposing his patient to a great deal of shock, by taking the usual precautions, keeping the intestines warm and aseptic.

The great factor in these operations is time, and none of these operations should last three hours and a half, as Madill.[3]

The old Lembert suture ought to be discarded for the suture which I have used lately, and which was devised by a New York hospital interne, whose name I have forgotten. It consists in first taking a sub-mucous stitch from one end of the wound to the other on one side, and then a continuous saddler's stitch, which only takes the peritoneal coat. When the ends are tied together this makes just as strong, if not a stronger, stitch than Lembert's, and it is much more easily and quickly done. This may be repeated over and over again, making two rows or a few superficial Lembert sutures fitted so as to make it doubly sure. In that way a great deal of valuable time will be saved.

Of Senn's hydrogen gas test, I will only say that it is very valuable, but it is sometimes better to do away with it altogether, not as McGraw says, for fear of bursting adhesions

[2]Annual of the Universal Medical Sciences, 1890, Vol. 3, C, 31.

[3]Annual of the Universal Medical Sciences, 1890, Vol. 3, C. 32, 33.

newly formed, and making a general peritonitis out of a local one, but to save time, because I think all cases should be operated before peritonitis sets in, because the chances of recovery are very much lessened when inflammation sets in.

I desire to add the report of another successful case of laparotomy for perforating gunshot wound of the abdomen, to the literature of the subject. It is as follows:

Joseph Kicklan, æt, 13, was playing with a small pistol, calibre No. 22, short, on June 2, of this year, and accidentally shot himself in the abdomen. The bullet penetrated into the right epigastric region right below the xyphoid appendix, 2 cm. to the left of the linea alba. The accident occurred about eight o'clock in the morning, and I saw him an hour after the accident. I found the patient lying on his back, complaining of no pain whatever. Pulse was 85, regular and full; temperature normal He had no vomiting, he complained of no pain, he was not in a state of shock. An examination revealed no tenderness over the abdomen, no tympanites. The patient could pass his urine freely; he had had no evacuation of the bowels since the acci dent. I immediately prepared for an operation, and at 11 o'clock of the same day, after all aseptic precautions, I proceeded to operate.

Median incision from the xyphoid appendix to the umbilicus. Examination of the parts revealed a perforation of the lesser lobe of the liver, from which bright arterial blood was oozing quite freely. This was closed up with a heavy silk suture which was passed about 1 cm. on each side of the perforation, and tied tightly. Next I proceeded to examine the stomach, and a perforation was found in its inner curvature through which its contents could be forced. This was closed up with the continuous stitch I have above described, and for more security, with four Lembert stitches forming a second row above that. The blood and other matter which lay near the perforation was care fully removed and cleaned with sterilized cheese-cloth, and the examination of the intestinal tract was proceeded with. The intestines were all found intact and returned. The external wound was closed up and a gauze drain inserted, leading to the wound in the liver, on account of its inclination to bleed. The patient rallied very nicely, and in his after history never had a temperature above normal. For the first three days nothing was given him by the stomach except a little ice-water and small lumps of ice, of which he took very little. On the third day I began feeding him gruels and light broths, and on the fourteenth day he could sit up. He is now entirely well.

THE TREATMENT OF HYDROCELE BY CARBOLIC ACID INJECTION.[1]

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CARBOLIC acid for the cure of hydrocele is said to have been employed as early as 1872 by Levis, of Philadelphia, but no report was made of it until 1881.

Since then a number of articles have been written by leading surgeons in this country, thoroughly approving of the method.

The radical or cutting operation of Volkman and its various modifications, while usually successful in relieving the hydrocele, require the use of an anæsthetic, and a week or more in bed should suppuration occur.

The method of Levis by carbolic injection is practically painless, confinement to bed is in no sense essential to the relief of the condition, and unless an inordinate amount (over thirty minims) be used sloughing should never occur.

Out of the large number of cases of hydrocele met with in the hernia department of the Hospital for Ruptured and Crippled, I have injected fifty-four with carbolic acid.

APPARATUS.

The simplest and most efficient apparatus is a small trocar. After thorough evacuation a hypodermic syringe can be screwed on to the canula, permitting the injection being made

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[1] Read at the Seventh Annual Meeting of the Fifth District Branch of the New York State Medical Association, held in Brooklyn, May 26, 1891.

without allowing one drop of the acid to come in contact with the skin of the scrotum.

When m. v·xxv of liquified crystals of carbolic are distributed over the whole serous surface, two or three minims in each place, nothing more than a sense of warmth is felt. After removal of the canula, slight kneading of the sac may be done to insure thorough coating of its walls with the irritant.

Usually within twenty-four hours the height of the inflammatory reaction will have been reached, which consists of lymph and serous exudation, at times becoming hæmorrhagic. In a number of cases I have used a small aspirating needle to ascertain just what process was going on, and in several instances I removed the recently exuded fluid, allowing the sac walls to collapse more quickly.

Of the 54 cases, 9 were never seen after the injection; 5 paid me one visit within the first week only, and 4 are at present under observation. This brings my number down to 36, all of whom were cured; 27 had one injection, 4 had two injections, 5 had three injections.

In no case has sloughing occurred, and not one of the 36 patients lost more than 24 hours from business From two to six weeks is necessary for absorption of the exudation to take place, and thickening of the sac may remain much longer.

Although a drachm and a half of the acid has been injected, without any detrimental effects, a smaller quantity has caused sloughing. I therefore prefer doing a second, or even a third operation, using in no case more than thirty minims.

Conclusions.

1. Carbolic injection is a safe method for the cure of hydrocele.

2. It is practically painless.

3. The patient is allowed to attend to business without more than one day's delay.

4. The disagreeable effects of an anæsthetic are avoided.

NOTE ON BROMIDE OF ETHYL AS AN ANÆSTHETIC.

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IN THE Annals of Surgery for November, 1890, appears an abstract of a lecture by Haderup on the above subject, which inclines me to give the results of my experience with this anæsthetic.

I have used it many times in operations on children at the Laura Franklin Free Hospital for children, in this city, and thus far have had no dangerously disagreeable experience with it. I have also used it in private practice to some extent generally on children, but have tried it two or three times on adults. The preparation preferred, and the one most frequently employed, has been Merck's and that in my hands has been found the most reliable.

My first experience in its use was with an adult in which it was given during the application of a very strong galvanic current for relief of hæmorrhage caused by fibro-myoma of the uterus. In this case it worked well, the patient being kept under perfect narcosis for about ten minutes. No nausea or other disagreeable symptom followed its administration. In other adult cases I have not found it to work so well, and have usually failed to produce complete anæsthesia. This I have attributed to the nervous state of the patient.

With children, however, the result has been different. Narcosis is quickly and completely induced and easily maintained, and one peculiar feature which I have noticed is, that after the patient has been once completely under its influence he may be allowed to come out and while apparently perfectly con-

scious, will lie quiet with his eyes open and even able to answer questions, he does not seem to feel any pain and the last steps of an operation may be completed with the patient in a state of painless consciousness.

Anæsthesia is generally complete within a minute but the patient will come out of it almost as quickly. The return to consciousness being more like the waking from a sound sleep. Usually a few drops is all that is required to produce anæsthesia and I seldom have more than 15 or 20 drops applied to the inhaler at once. The inhaler which I employ is simply a tight cap made from a newspaper and a towel, and at first the patient is allowed a few breaths of mixed air and the bromide of ethyl vapor. Then the cap is placed down close over the face as with sulphuric ether. I have never noticed any particular effect on the heart's action. Vomiting is frequently produced.

In my cases it has been given usually for short operations and for dressing painful wounds in very restive children and the duration of the anæsthetic state lasting from 2 to 15 minutes.

From my experience I am much inclined to favor its use in such cases where it is necessary to produce the anæsthetic state in a child for a short time, but for adults I have not as a rule, found it powerful enough to produce the desired effect.

THE MÜTTER LECTURES ON SELECTED TOPICS IN SURGICAL PATHOLOGY.

SERIES OF 1890-1.[1]

By ROSWELL PARK, A.M., M.D.,

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LECTURE VIII.

TUBERCULOSIS.

SYLLABUS. *Tuberculosis.*—Slowness of English and American writers to properly appreciate the matter of surgical tuberculosis. Tuberculosis of lymphatic glands; of bones; of joints; of tendon sheaths. Character of infectious granuloma everywhere the same.

SO much has been said and written about tuberculosis within the past ten years that it seems now hardly necessary to try to educate the professional public as it seemed a few years ago. It has always struck the writer as one of the curiosities of medicine that the English speaking people should be so slow to appreciate the frequency of tubercular processes in parts of the body aside from the lungs. Those who were thoroughly familiar with its pathology and clinical aspects in the lungs were yet extremely slow to acknowledge its common existence elsewhere. For instance, I recall one of my old and esteemed teachers, who, only fifteen years ago, took occasion to assure his classes that tubercle was never found in the bones. Such a statement as this was much worse than nothing, since it rendered many of his auditors in-

[1] Delivered before the College of Physicians, Philadelphia, December, 1890.

disposed to pay that attention to the matter which it deserved; and so I have observed that, with a few striking exceptions, English and American authors alike have been extremely slow to recognize that which has long been recognized on the Continent. Such a thesis, for instance, as that of Nelaton, which was published over fifty years ago, and which contained illustrations fully equal to most of those which appear now, and in which he described carefully and explicitly both disseminated and confluent tubercle, has scarcely been alluded to by his English-speaking successors. These gentlemen, on the contrary, have gone on, some of them even to the present time, disregarding knowledge which could so easily be obtained, and describing scrofula of bones and glands as if no better information were at hand than was afforded one hundred years ago. A new school of young and accomplished pathologists has grown up in Great Britain and in this country, who have atoned in large measure for the wilful ignorance or misrepresentation of their elders—men, for instance, like Treves and Sutton, Senn and Gerster, and others, to whom the present generation is largely indebted for the insistence with which these views have been promulgated. Nevertheless so much literature is now at hand, even to the student who reads only his mother tongue, that it hardly seems necessary to attempt any general discussion of the disease in its surgical aspects, nor to do more than ask your attention to a few of its more interesting or less known phases. First of all with regard to its specific and infectious features, there is no time now in which to go over the experimental proof of the doctrine of specific infection. He who is not reasonably well informed in this topic will have little use for such lectures as these.

That the tubercle bacillus possesses facultative pyogenic powers has been shown in an earlier lecture. That most of the abscesses caused by breaking down of tubercular gummata, or of specific granulation tissue, are due to a secondary infection will be spoken of later. Our interest at present is rather in the direction of certain manifestations of the disease with reference to tracing, if possible, the port of entry of the specific germs, or the path of infection. It may be said, however,

with regard to the cold abscesses which so often result from slow tubercular processes, that bacilli are relatively seldom found in their puruloid.   This failure to find them is easily explained, since in many of these cases the puruloid collection is months or even years old, and all living organisms have long since died out in such material.   On the contrary, the original membrane or condensed layer of cells, by which protection was at first afforded the healthy tissues against infection, has become more and more firmly organized and still constitutes the membrane to which the old and entirely improper term pyogenic was misapplied.   It was shown early in this course of lectures that the proper distinction for this membrane should be *pyophylactic*, implying the protection which it really affords.   In certain other cases of recent cold abscesses, the microscope and the culture medium yield no evidence of bacilli, while, nevertheless, inoculation experiments succeed.   This is to be explained through the medium of spores which are unrecognizable by other methods, but which manifest their specific peculiarities when planted in the living animal.

Tuberculosis of lymphatic nodes.—These comprise practically all the glandular manifestations which the old writers grouped under the head of struma or scrofula.   When these cases belong to the category of the surgical, they are usually cases where the point of inoculation is more or less removed from the gland or glands involved.   Any lesion of cutaneous or mucous surface, recent or old, may lead to this.   In the mouth, for instance, a mucous patch, a canker sore, a diseased tooth, an inflamed tonsil, may serve equally well.   Whereas on the body surface any abrasion or pathological defect may afford a port of entry, although the germ may be transmitted to the nearest lymph gland, and the lesion through which it enters may heal without any visible reminder of the previous infection.

The lymphatic nodes in the neck, for instance, may be affected as the result of some skin disease of the face or head, of which eczema is the most common form, or through diseased eyelids, as the result of catarrhal or specific ulcers in the nose; of a diseased middle ear, or through any dental or mu-

cous lesion in the mouth or pharynx. The nodes act as filters and become blocked or plugged as do many other filters, by which obstruction a limitation of infection is for an indefinite time produced. This is brought about in effect by an inflammation, *i. e.*, a lymphadenitis by whose inflammatory products the lymph channels are obstructed. Along with this goes usually a certain degree of peri-adenitis, by which perhaps still further protection is afforded. The tubercle bacillus is non-motile, and infection of nodes which are not in the direct course of the lymph stream must probably be explained by conveyance through the agency of migrating amoeboid cells. It is of interest, also, to remember that infection is spread usually through glands belonging to a definite regional system. Thus if it be one of the deep glands which is first infected, it is those belonging to the deeper group which become later involved. Nevertheless as there are connecting branches between the two systems infection may spread from one to the other. As long as infection is confined to the nodes the patient is protected against miliary invasion. So soon, however, as the last lymphatic glandular filter has been passed, dissemination must and will readily follow.

Tuberculosis of bone.—Next to the nodes the bones are most frequently involved, and most so in children. The favorite location is in the neighborhood of the epiphysis of long bones; next, most commonly in the cancellous tissue of the short and irregular bones. We can scarcely imagine a primary tuberculosis of an unexposed bone, consequently, disease of this kind is always a sign of a previous and, perhaps, concealed lesion. When bacilli are once floated loose in the blood-stream they are more likely to be entangled by this peculiar tissue, growing bone, than by any other part of the body. We have, as it were, a mycotic embolism of a minute artery, the fixation of which gives ready impetus to the formation of a minute nodule of infectious granuloma. It is well known that the typical manifestations of tuberculosis in a bone consist of a conical infarct or sequestrum, and König taught that this was due to an occlusion of a small artery by a tubercular embolus; while Mueller, one of his pupils, proved the accuracy of this view by direct intra-vascular injection.

It is to one point, especially, in connection with bone tuberculosis that I desire to allude at this time, and that is to a form of acute miliary tubercular osteomyelitis corresponding in bone to acute miliary tuberculosis in the lung. Its clinical manifestations are not so very different from those of the acute infectious variety due to pyogenic infection, save that they are a little less acute. There are not the fulminating attacks, nor the intense pain which characterizes the latter form, and, yet, it may be followed by nearly as much local destruction. Nor is it likely to be so early recognized, nor does it perhaps call for quite as early radical treatment. Moreover, if allowed to go for a time unrecognized it is not so likely to determine the death of the individual, since spontaneous relief, after a fashion, is more commonly afforded. This form of disease is described alike by French and German writers; but I have never seen any reference to it in English. König makes it the fourth of his forms of osteo-tuberculosis, and Kiener and Charvot gave it a somewhat imperfect description a few years ago. The periosteum is more commonly involved than in other forms, and there is no tendency to regularity or limitation in the formation of sequestra. It has been my lot to meet with several cases of this kind for which more than once I have had to practice amputation. The last distinctive case which I saw was one of nearly total necrosis of the shaft of the tibia, with spontaneous perforation of the skin in the endeavor to eliminate the sequestrum, which consisted of this diaphysis. This had been regarded at first as a case of acute rheumatism.

I think we have also a sub-form of this character where the acuteness of the disease consists simply in an exacerbation of an old and latent focus in the same bone.

This condition may be fatal, sometimes by intensity of a mixed infection from the introduction of a septic element, or sometimes by metastatic and general miliary disease.

Tuberculosis of joints.—A large proportion, especially in children, of tubercular joints, are really in effect extensions of tubercular foci in adjoining bones. Nevertheless, a form of primary synovial tuberculosis is known, and is more frequent in the adult. Tubercular infection of a previously healthy

joint presupposes the entrance of the germ through the respiratory tract, alimentary canal, or some surface lesion. The growth of co-called fungus granulation tissue into a joint is precisely similar to its growth or formation in a tendon sheath, and may be thus described. It is well known that wherever tubercle bacilli lodge, they act as specific irritants, which produce granulation tissue of a well-known type. This granulation tissue, as it forms, has the power of making way for itself in any and every direction, and the firmest and thickest bone will melt away before its advancing pressure, as it does before that of an aneurism. This tissue may gradually replace the cancellous tissue of the head of a bone, and finally escape by one or more perforations of this compact shell to burrow underneath the periosteum and work its way toward the skin, or to perforate articular cartilages and proliferate within a joint cavity. Wherever it appears it is always the same in structure, although sometimes more compact, or at other times more œdematous. It often happens that the free space of a synovial cavity is filled up with this tissue, which becomes more or less condensed, and which disintegrates, and in many ways affects the surrounding, previously healthy tissues, before a drop of pus is formed. It is seldom under these circumstances that the tubercle bacilli evince any pyogenic properties by themselves; but a mixed infection is likely to occur at any time and secondary pyogenic infection does in fact occur sooner or later in every case. The result of this is that this granulomatous tissue of low vitality breaks down very easily, and we have, as the consequence, an abscess formation and all the well-known phenomena of the later stages of white swellings. Of course, if at any point this granulation tissue has perforated the skin, local infection necessarily occurs, otherwise the infection is usually through internal channels.

This same condition of affairs obtains when we have to do with tuberculosis of tendon sheaths. Hueter called this affection *tendo vaginitis granulosa*, and the granulation or fungus tissue with which these sheaths are often filled has precisely the same origin and significance as above. Furthermore, Riedel has shown us that the rice-grain bodies so often found in hygromata of tendon sheaths always indicate synovial tuber-

culosis.   This condition is most common as the extension of a tubercular process along tendon sheaths, following perforation of a tubercular joint, but is now known to be also a primary lesion.   When primary it is usually an embolic infection, which when once begun pursues everywhere a typical course. The tendon itself is usually covered with a thin layer of the same granulation tissue, and may be so weakened as to easily rupture.

When the disease is primary in a tendon sheath, an adjoining joint may easily become secondarily affected.   When the fungous granulations forming hard white masses are separated by friction, the so-called rice-grained bodies are formed, or else they are the product of a peculiar fibrinous inflammation and exudate.   The disease is most common in the wrist, next most so about the ankle.

Dmochowski has investigated the tonsils in fifteen consumptive patients, and in each case discovered more or less outspoken evidence of local tuberculosis.   The naked eye appearances were scarcely altered, but the epithelial cells of the crypts die soon after infection, and, finally, produce a superficial dead layer.   After this we may have the tonsils studded with miliary nodules, or these may coalesce and the whole gland become little less than a tubercular gumma.

A similar infection of the mammary gland I have elsewhere described. (See *American System of Gynæcology*, Vol. 2, p. 358). The commonest manifestation of mammary tuberculosis is to be met with in the form of cold abscess and chronic fistula; aside from these we have to deal with disseminated tubercle, and tuberculous gumma; local infection having occurred the disease takes much the same course as in the lungs.   Multiple true tubercles are formed, which may for some time remain separate, or they coalesce, in which case we have the confluent form.   To these succeed caseation, which may be followed by atrophy and more or less calcification, or there develop cold abscesses as the result of a degenerative process, or acute abscess as the result of mixed infection.   Probably a true miliary form exists, but has not yet been generally recognized, perhaps, because patients presenting it are not seen

sufficiently early, *i. e.*, have passed this stage by the time they apply for treatment.

And so it goes on all over the body, there is no part which is exempt from liability to tubercular infection, and tubercular processes are everywhere essentially the same, modified only by character of tissue and nature of environment. Every surgeon of experience sees astonishing manifestations of the penetrating and permeating power of this peculiar granulation tissue; the toughest and strongest fasciæ are perforated by it as is the copper sheathing of large vessels perforated by various salt water parasites, while at the same time masses of this tissue are deflected, as it were, or turned aside and made to take most unexpected directions by the resistance which a thin layer of fascia will interpose. An intelligent comprehension of infectious granulomatous tissue, and its properties, will enable a ready understanding of such processes as caries, necrosis and spontaneous separation of sequestra, as well as of the clinical features of white swellings and ganglia and a variety of other common manifestations of tubercule, which I regret to say are so often the bug-bear of students, and of all those who are not grounded in pathology.

Probably the most difficult of the many problems which a study of this disease offers is that concerning the source of the infectious element and its hibernation for an indefinite time in some concealed part of the system. Evidence has of late accumulated to show that in the deep collection of lymph nodes we often have both concealed and long standing foci of infection which, like powder mines, give rise to sudden explosions.

In 1887 Bollinger carefully examined the bronchial lymphnodes of a large number of children who died during a severe epidemic of the measles. He demonstrated that tuberculosis may be latent in a child apparently in perfect health, and he found abundant bacilli in the lymphatic nodes at the roots of the lungs, and in the mediastinum, in children who were free from tubercule in the lungs proper or other parts of the body. Also it has been demonstrated by numerous observers that children may have for a long time latent glandular tuberculosis before phthisis develops, since in children the lymphatic nodes are in a high state of functional activity.

Loomis (*Med. Record.*, Dec. 20, 1890,) and Northrup (*N. Y. Med. Jour.*, Feb. 21, 1891,) have lately made important communications showing how the primary infection of tubercle, especially in children, often occurs in the bronchial lymph nodes. Loomis reports, for instance, such an autopsy as follows: A young woman æt. 26, who enjoyed perfect health to within four weeks of her death, was seized with fever and chills, which led first to a diagnosis of malarial fever that was afterwards changed to that of general pulmonary tuberculosis. At the autopsy the lungs were found studded with fresh tubercles. No old tuberculosis was found in the lungs, nor could any point of infection be found *except one large bronchial gland* which presented all the characteristic changes of an old tubercular process. He mentions also a case presented to the New York Pathological Society by Dr. Van Giesen, of an infected bronchial gland, evidently tubercular, removed from a person dying from phosphorus poisoning. No tubercles were found in any other part of the body. These gentlemen have made it so very clear, by their own cases and those which they have collected, that the internal glands may be long and latently subject to tuberculosis before they disseminate the disease, that I think we have large reason to take the ground that infection of parts which interest the surgeon may occur with equal ease from these internal sources. Considering that the life-stream is from the lungs toward the lymphatic nodes, it is not more difficult to imagine how a lung may be affected from this source than how a bone at some distance may be. They are probably conveyed into the veins first, after which they are easily distributed to distant parts of the body.

Müller, commenting upon 500 autopsies in children with respect to the frequency of tuberculosis, regards the lungs and next to them the bronchial glands as the most common paths of infection by tubercular processes. He recognizes the fact that the glandular infection may be primary, in which case the lungs are secondarily involved by contiguity, in which case also the apices are not the parts first involved. It is characteristic of tuberculosis in children that the lymph glands should be early involved; 170 times out of 209 cases was this the case, and of these 170 the bronchial glands were involved in 131.

Next to these stood the mesenteric, 78 times; the cervical, 17; the mediastinal, 16; retro-peritoneal, 10; portal, 7; epigastric, 6; inguinal and retro-maxillary, each 3. Tuberculosis of the bones and joints occurs most often in the fourth year of life.

Sprengel has called attention to the importance of a previous tubercular infection of the skin or mucous membrane by which open disease may be produced, either through the lymph stream or the arterial. It is necessary also not to overlook the existence of primary infection through inherited, *i. e.*, congenital tuberculosis. All writers on the subject agree that the tubercular process often remains latent for a long time, by latent meaning localized, and that generalization is especially favored by any disease which causes prostration, as also by certain specific diseases, like measles, scarlatina, pneumonia, diphtheria, puerperal fever, etc. This generalization is effected sometimes by the lymph system, much more often through the blood system; thus out of five hundred cases of tubercular disease, eighty-six were of the general miliary form, nineteen of these of the most acute type. Müller finally lays considerable stress upon a peculiar form of tubercular disease in children, characterized by a tendency to caseation, as an instance of which we have the relative frequency of caseous pneumonias.

Demme has recently reported some interesting observations in this same field, one of them being that of an infant of six months, that displayed a tubercular ulceration over the left breast. He considered it most probable in this instance that he had to deal with a tubercular infection involving a small abscess which had resulted from a limited mastitis directly after birth, since the mother and sisters of the child, who were themselves suffering from consumption, often applied to the ulcerated surface one of their soiled handkerchiefs. Another case was that of multiple tubercular disease of the mouth in an 8-year-old, predisposed, girl, who suffered at the time from pulmonary lesions, and who died of acute generalized miliary disease. The affection presented a remarkable similarity to mucous patches, and had been mistaken for inherited syphilis. Antiseptic treatment produced no effect, however, and tubercle bacilli were found in the local lesions.

A third case was that of a tubercular meningitis following quickly after injury to the skull, in a child previously healthy. At the autopsy the pia was found studded with miliary tubercles, and an old tubercular bronchial gland was recognized. In such case as this it is probable that almost any injury may prove sufficient to determine an outbreak of tuberculosis.

Tricomi has reported a case of joint tuberculosis which manifested itself in the early years of childhood, and apparently healed with anchylosis of the joint. Seventeen years later after forcible efforts had been made to straighten the limb the patient died of general tuberculosis. Examination of the joint revealed old tuberculous foci which had communicated with the joint, with the typical features of fungous arthritis. The internal organs were studied with miliary tubercles, all fresh, showing nowhere any old lesion save in the joint. He interprets the case with propriety as in all probability demonstrating the possible long period of latency and the fresh eruption after operative provocation. (*Giornale internaz. delle scienze mediche.*, 1886, 8, p. 628.)

[TO BE CONTINUED].

EDITORIAL ARTICLES.

GONNESCO ON INTERNAL RETRO-PERITONEAL HERNIÆ

The subject of herniæ occurring into normal depressions and openings of the peritoneal folds is exhaustively considered by the author, Dr. T. Gonnesco, of Paris, in a brochure of 299 pages. In view of the little attention which is usually given to this subject, a full resumé of the points brought out in this systematic treatise is herewith given. Four varieties are described, as follows:

1. Duodenal hernia, developed in the fossæ of the duodenal region.

2. Pericæcal herniæ, developed in the pericæcal fossæ.

3. Intersigmoid herniæ, developed in the intersigmoid fossa.

4. Hernia through the foramen of Winslow, situated in the cavity behind the omentum.

The anatomical relations and the pathological anatomy of each of these varieties is then discussed, followed by observations as to etiology, symptoms, diagnosis and treatment. We shall take them up in turn, as given by the author.

I. Duodenal Herniæ. Anatomical Relations.

On lifting up the transverse mesocolon, and spreading out to the right the small intestines, the ascending portion of the duodenum is exposed. To the left of this portion of the duodenum the peritoneal fossæ are located.

1. Inferior Duodenal Fossa.—This is the most frequent, having been observed in 73% of cases. Situated along the beginning portion of the duodenum, it has the form of a cornucopia embracing the intestine in its concavity. The top of the fossa is directed to the right and touches the root of the mesentery; its orifice is directed upward

and is circumscribed by the free border of the inferior duodenal fold. This fold, of triangular form, presents a free falciform border, with its concavity directed upward and its two extremities lost; the right on the anterior surface of the duodenum, the left on the peri-renal peritoneum. Being without fat or vessels it forms a delicate curtain. The peritoneal cul-de sac is therefore limited on the left and in front by this fold, on the right by the ascending intestine, and behind it rests upon the left side of the third lumbar vertebra. Its depth is about 3 cm. The size of the orifice is variable, admitting generally the index finger. The inferior mesenteric vein always passes along its left adherent border. The left colic artery is some distance from the upper part of the fold. These two vessels crossing some distance from the fossa turn downward and to the left. The fossa is thus quite isolated of all vessels, and is practically non-vascular.

It sometimes occurs that the free border of the orifice of this inferior fossa continues around to the left and is continuous with the free border of the upper fossa, thus forming a single circular orifice which opens into both the upper and lower fossæ.

2. SUPERIOR DUODENAL FOSSA.—It exists in 50% of cases. Very frequently it is seen coincident with the inferior fossa. It is always situated opposite the upper end of the ascending portion of the duodenum. This is an inverted fossa, the orifice looking downward and directly opposite the lower fossa. The orifice is limited by a fold of peritoneum. The superior duodenal fold is triangular and forms the anterior wall of the fossa. It presents a free semilunar lower border, directed downward, of which the left extremity is continuous with the prerenal peritoneum, and the right horn with the covering of the duodenum. The summit of the fold is lost above in the inferior layer of the transverse mesocolon; its left border is continuous with the prerenal peritoneum; the right is lost upon the intestine. The fossa is limited above by this fold, on the right by the duodenum, it is stopped above by the body of the pancreas, and rests upon the body of the second lumbar vertebra in the angle formed between the left renal vein and the abdominal aorta. It is about two cm. deep. The inferior mesenteric vein comes up on a level with the orifice of the fossa, passes to

the left across the border of the fold and is lost beneath the pancreas above. The vein always passes in the substance of the fold along its free border.

3. DUODENO-JUJUNAL OR MESOCOLIC FOSSA.—The rarity of this fossa (5 in 30) is explained by the fact that its existence necessitates the penetration of the duodeno jejunal angle into the substance of the root of the transverse mesocolon. In five cases it was simple in four, and double in one, that of a child two and a half years of age.

a. The Single Fossa.—On lifting up the mesocolon and drawing forward and to the right the jejunum, the duodeno mesocolic folds or ligaments extending between the duodeno-jejunal angle and the meso-colon are exposed. These two folds are formed by the passage of the two leafs of mesentery into the mesocolon. Limited by these folds in one part, by the back of the duodeno jejunal angle in the other part, and finally the inferior mesenteric vein, appears an almost circular orifice which leads into a deep fossa. This fossa sinks into the root of the mesocolon, and is engaged in a prevertebral space corresponding to the second lumbar vertebra, and limited above by the pancreas, on the right by the aorta, on the left by the kidney of that side. Coursing along under this cavity is the renal vein. The orifice admits the little finger. The depth of the fossa varies between 2 and 3 cm.

b. The Double Fossa.—Rarely a third fold is present, giving rise to two fossæ.

Pathological anatomy.—From an anatomo-pathological and physi-ological point of view two varieties of duodenal hernia may be distin-guished. One is developed and always seated especially in the left half of the abdominal cavity. This is the ordinary type, first described by Treitz. The other is the rare form which appears in the right side of the abdomen.

LEFT DUODENAL HERNIA.—When the abdomen of a person carrying a duodenal hernia is opened, and the epiploic apron lifted up, one of two things may be observed. Most frequently the whole mass of small intestine is found enclosed in a peritoneal sac. Or, on the other hand, the hernia may be small and concealed by the convolutions of intestine, and finally discovered against the left side of the vertebral

column, near the root of the transverse mesocolon, containing a small loop of small intestine. Between these two extremes are many gradations. The variety of size permits of the dividing of duodenal hernia into three groups: small, medium, and large, or complete.

The small herniæ described by Treitz contained from 2 to 5 cm. of jejunum. Rarely they remain this size. There is a tendency to increase until the full development is reached. Ordinarily the sac becomes larger and larger, and presently it occupies much of the abdominal cavity, and contains the whole length of small intestine. It is in these cases that one does not see more, on opening the abdominal cavity, than a serous sheet covering the whole mass of small intestine, and covered in its turn by the large intestine. The volume of the sac varies from that of a small nut to that of the head of an adult, or larger, occupying the largest part of the abdominal cavity. The hernial sac begins to develop to the left of the vertebral column. It rests upon the left renal vessels, on the psoas muscle, and presents with the left kidney relations which vary with the size of the hernia. Above it is the pancreas and the root of the transverse mesocolon. Thus the posterior wall of the sac of a small hernia extends between the pancreas above, the lower extremity of the left kidney below, the vertebral column and the abdominal aorta within. As the sac increases it extends upward, downward and to the left, and finally encroaches upon the right half of the abdominal cavity. In a complete hernia the abdomen is more or less distended. As this great serous sac surrounds it, the intestine preserves its normal position. The sac completely fills the middle of the abdomen and is surrounded by the large intestine in its course. It does occur that the great sac enclosing the small intestine may have the transverse colon around its lower border, and be bounded above by the stomach. Or the whole mass of great intestine may lie to the right of the sac.

The orifice of the sac has a variable relation to the abdominal wall. The variations depend on the volume of the hernia. In a general way it may be said that the orifice is situated in that portion of the abdomen which corresponds to the location of the duodenal fossæ. In the case of large herniæ the orifice is apt to be to the right of the vertebral

column, low down in the iliac fossa near the sacrum. The orifice averages 6 cm. long and 4 cm. broad, admitting two to four fingers. The anterior border is free, the posterior adherent.

The true sac is formed of a single serous layer. The second layer which covers the free portion of its circumference is nothing more than a superadded leaf. The duodenal fossæ have their anterior wall formed by a serous layer composed of two laminæ, of which one invaginates to form the fossa, and the other is continued on the peritoneal layer of the duodenal region, which is a continuation of the layers of the different mesos which enclose this region. The mesentery of the intestine contained in the sac is continuous with the internal layer of the sac. The free border of the hernial orifice is formed by a reflection of the external layer upon the internal; thus it represents a peritoneal fold formed of two layers. The two pillars or corners of this fold loose themselves, one on the right or upper layer, the other on the left or lower of the mesentery of the segment of small intestine which is in the sac.

The vessels about the orifice are numerous. All the free border is surrounded by an artero-venous arch. At the upper part of this border and closely hugging it, the inferior mesenteric vein passes. In the anterior part of the border the left colic vein and artery pass.

The contents of the sac is always small intestine with its mesentery. In the great majority of cases all of the small intestine, excepting the first part of the duodenum and a very small portion of the ilium, is contained in the sac. All of the cases of complete hernia observed have occurred in persons between the ages of 22 and 58 years, whereas the incomplete herniæ have been observed in those from 2 months to 19 years of age. If the hernia is small it is always the jejunum which is herniated; and the jejunum with a portion of the ilium if the hernia is larger. The intestine commences to introduce itself by a part of the duodenum or the duodeno-jejunal angle. The herniated gut does not present much change. Most frequently it becomes distended by gas. This may be the cause of more or less obstruction in the intestinal canal. Adhesions may take place. A chronic peritonitis of the sac and its orifice is observed in a certain number of cases. It causes

adhesions between the sac and the neighboring organs or with the abdominal or pelvic wall. Adhesions may occur between the orifice of the sac and the intestines which pass through it. The cæcum may become adherent to the orifice and completely plug it. In case of strangulation the seat of the trouble is always the neck of the sac. The lesions are the same as in all cases of strangulated hernia, external or internal. Invagination of the herniated gut has been observed in three cases of duodenal hernia.

In a great number of cases of non-strangulated duodenal hernia, discovered by chance at the autopsy, there has been observed a congestion, more or less intense, of the abdominal viscera. The organ found most congested was the spleen. The liver, the left kidney and other viscera have been found greatly congested. Dilatation of the hæmorrhoidal veins has been frequently observed. These are signs of venous obstruction from pressure of the tumor.

RIGHT DUODENAL HERNIA.—Much that has been said above applies also to this variety of hernia. There are but eight recorded cases of this class. The hernia is located in the right half of the abdominal cavity. The hernial sac passes in front of the vertebral column over into the left side of the abdomen. It has around it the colon. The orifice is situated in front of the third lumbar vertebra, and presents a variable diameter, averaging about two inches. The free anterior border of the orifice is semilunar with its concavity turned to the left or directed backward. The upper horn reaches the side of the terminal portion of the duodenum to loose itself in its serous layer. The duodenum enters the sac at the upper part without passing around the pillar of the orifice. The inferior pillar has passing around it the terminal portion of the ilium which penetrates into the sac. The posterior wall of the hernia rests upon the vena cava, the right psoas, the right renal vessels, the anterior surface of the right kidney and ureter. The anterior wall is formed of two serous layers, one external, the other internal, which are reflected the one upon the other at the free border of the orifice. Leaving this orifice the external layer passes to the right and reaches the internal border of the ascending colon, passes over the two-thirds of the circumference of the latter, afterward to

the right of this, and is lost on a level with the external border of the right kidney in the parietal peritoneum. This layer is thus formed by two layers of the ascending mesocolon, separated by the hernial sac. Above and to the right the external layer is continuous with the right colic angle, and the half or more of the transverse colon covers the colon and continues as the upper layer of its meso. So the hernial sac in these cases is developed beneath the internal layers of the ascending mesocolon and a portion of the inferior layer of the transverse mesocolon; this explains the adherence of the sac to the ascending colon, to the right colic angle and to the right segment of the transverse colon. As to the internal layer, it lines the external, and leaves it at the right inferior and superior borders of the sac to be continued with the single layer which forms the posterior wall, adherent to the sac.

The superior mesenteric artery, leaving the aorta near the lower part of the duodenum, passes into the superior pillar of the free border of the orifice and ramifies throughout this fold between the two serous layers which form it. From the convexity of the artery spring the branches to the small intestine, which pass into the substance of the mesentery and with it into the sac. From the concave border the colic arteries, which pass between the two layers of the anterior wall of the sac in describing their ordinary courses, pass to the front of the ascending colon and the right segment of the transverse.

All of the small intestine is contained in the sac. A single intestinal tube emerges by the orifice at its lower part; this is the terminal portion of the ilium. When the ilium turns about the border of the orifice to meet the cæcum, it presents a slight twist upon its axis. The duodenum enters the sac at its upper part, not through the orifice, but by lifting up the posterior wall of the sac. Soon it separates from this wall and continues into the jejunum. The mesentery of the small intestine adheres to all of the periphery of the free border of the orifice of the sac.

The anatomical conditions necessary for the production of retroperitoneal hernia are (1), a dilatable excavation in the peritoneum; (2) a resisting ring; (3) a movable intestine pressing against this ex-

cavation. The peritoneum must be loose, the sub-peritoneal areolar tissue must not be dense. The resisting ring must be bordered by a vascular arc. Sometimes the jejunum at its upper part is fixed, being enveloped by the interior layer of the transverse mesocolon. When this condition prevails duodenal hernia is impossible. Treitz placed a section of small intestine partly under an inverted vase, and on passing water through it from without inward, observed that the intestine slowly passed beneath the vase.

As right duodenal hernia occurs in the inferior duodenal non-vascular fossa, its formation demands explanation. The ascending portion of the duodenum presses against the external or anterior wall of the fos-a. The duodeno-jejunal angle, poorly supported by the muscle of Treitz, sinks down and thus favors the displacement of the ascending portion of the duodenum. This sinks and presses forward the inferior duodenal serous fold. Thus little by little the serous cul-de sac is pressed from left to right and from above downward. This fossa has no immediate relation with the arterio-venous sac above mentioned. The serous pouch, instead of forcing itself beneath, passes over it. The pouch once formed continues to develop in the direction of the least resistance between the root of the mesentery and the post-abdominal wall. It is directed to the right, and passes beneath the internal layers of the ascending mesocolon and inferior layer of the transverse. With the progress of the hernia the orifice elongates more and more; the free border, limited by the serous fold, is displaced downward and to the left. Soon the orifice of the hernial sac is limited in front, not by the free border of the inferior fold, but by the root of the mesentery, beneath which is engaged the hernial sac. In the free border of this orifice the superior mesenteric artery passes along to the root of the mesentery. The intestine thus engaged has to submit to a torsion around this root of the mesentery.

In a word, the herniated small intestine is completely reversed, and situated behind the root of its mesenteric pedicle which attaches it to the free border of the hernial orifice, in place of fixing it to the posterior wall of the sac as in left duodenal herniæ.

II. Pericæcal Herniæ.

Bardeleben (1849) was the first to describe the true situation of the cæcum. He said that it is sometimes almost completely covered by peritoneum, and that usually it had a short mesentery. The disposition which is most frequently encountered, according to Rieux, is that the peritoneum passes simply in front of the cæcum and holds it fast in the iliac fossa. The free cæcum is an exception. Engel's observations on 100 cadavers were as follows:

Ten times in the right iliac fossa, its head reaching to the internal border of the psoas, closely hugging the anterior abdominal wall in the inguinal region; 28 times it was situated above the psoas; 30 times it was situated above the symphisis pubis; 8 times deeply in the pelvis; 4 times in the region of the umbilicus.

About the cæcum are three fossæ: the ilio-cæcal, the ilio-appendicular, and the retro-cæcal (simple or double).

1. Ilio-Cæcal Fossa.—On the anterior aspect of the ilio-cæcal angle, in all cases, is a peritoneal fold which is a part of the anterior layer of the mesentery, which passes above or in front of the ilium to loose itself upon the cæcum. There is the mesenterico-cæcal fold. It is thin and transparent in the embryo and infant, and full of fatty tissue in the adult. The anterior ilio-cæcal artery takes a short course across this fold to the lower extremity of the cæcum. This triangular fold is inserted by its base into the anterior layer of the mesentery of the small intestine. Its apex is inserted upon the anterior surface of the cæcum near the root of the appendix. Its adherent border looses itself upon the anterior surface of the cæcum near the place of attachment of the ilium. Finally its free border, semilunar, with its concavity turned to the left, along which runs the artery, has its upper extremity lost upon the mesentery and the inferior extremity corresponds to the apex of the fold. Between this fold and the anterior surface of the ilium is an elongated opening, the ilio cæcal fossa.

2. Ilio-Appendicular Fossa.— Observing the ilio-cæcal junction from below two folds of peritoneum are seen, of which one, the posterior, extends between the mesentery, the cæcum and the appendix;

the other, the anterior, extends between the ilium, the cæcum and the preceding fold, on the anterior surface of which it is lost. These two folds are the true mesentery of the appendix and cæcum. Between them is the ilio appendicular fossa.

3. RETRO-CÆCAL FOSSA.—This fossa is due to the adhesion between the colon, cæcum and mesentery, and the posterior abdominal wall. The peritoneum, in passing from the intestine into the iliac fossa, is thrown into a number of folds which form pockets of greater or lesser depth. Ordinarily there are but two folds which limit a single fossa. Sometimes three are encountered, limiting two fossæ.

a. Internal Retro-Cæcal Fossa. Limited by two folds

1. The mesenterico parietal fold, described by some as the inferior ligament of the cæcum, is triangular; its superior border is inserted into the posterior layer of the mesentery at the ilio-cæcal angle a little to the left of the cæcum. Its parietal border is fast to the iliac fossa near the sacro-iliac articulation. Finally the free border is directed forward, and is concave. The apex of the fold is lost above and behind upon the mesentery.

2. The parieto-cæcal fold has three borders. The border adherent to the intestine is partly inserted upon the postero-external face of the colon and extends down upon the cæcum. Its parietal border is adherent to the lumbar wall, passes over the iliac crest to be inserted for a certain extent upon the external flank of the iliac fossa. Its anterior, or free border, is semilunar, the upper horn being lost upon the intestine and the inferior in the iliac fossa. The apex of the fold is lost in the angle formed by the junction of the colon to the lumbar wall. The faces of the fold look to the right and left. The peritoneum of the iliac fossa is thrust between these two folds behind the cæcum, and forms a pouch.

b. External Retro-Cæcal Fossa. Sometimes there are two parieto-colic folds. This gives two retro-cæcal fossæ side by side.

Pathological Anatomy.— Peri-cæcal herniæ may be divided into two groups. In the first the sac is situated between the cæcum and the iliac or lumbar wall. The second is the ilio appendicular variety.

RETRO-CÆCAL HERNIA.—Developed in one of the retro-cæcal

fossæ. The disposition and relations of the sac vary with the volume of the hernia. In the small hernia the sac is formed of a peritoneal pouch situated between the cæcum and the iliac wall. The sac is forced behind the ascending colon between the two layers of its meso. In its formation the hernia always takes the same course. The hernia always contains a knuckle of ilium of variable length.

The only example of voluminous retrocæcal hernia is the case of Engel. In this case the sac contained the whole of the small intestine, except the duodenum and extreme upper end of the jejunum and a small portion of the lower end of the ilium. The sac communicated with the peritoneal cavity by an orifice two inches in length. It occupied the right abdominal cavity. The cæcum was above and a little to the left of the unbilicus.

Ilio appendicular hernia. A very rare form.

III. INTERSIGMOID HERNIA.

Engel found, in 100 cadavers, the sigmoid flexure in the left hypochondrium in eight cases; in the middle of the abdomen, nearly to the epigastrium, in six; in the right hypochondrium, in the curvature of the colon, in two; in front of the cæcum in six; crossing transversely the lower abdominal region above the pubis in sixteen; in the normal position in the remainder of cases. In the normal condition the sigmoid flexure descends into the pelvic cavity to the innerside of the left psoas, afterward ascends a little almost to the promontory and returns downward to the rectum, describing a curve along the left wall of the pelvis. It is attached to the abdominal wall by a long mesentery.

On the posterior aspect of the sigmoid flexure are certain serous folds passing to the iliac fossa. Some of these folds are not constant. Two, however, are always present. One of these, the colico-iliac, arises from the inferior layer of the meso and the same layer of the beginning of the sigmoid flexure, to be lost on the psoas or to pass above the external iliac vessels to fix itself on the lateral wall of the pelvis. The other is seen on the same inferior layer of the sigmoid mesocolon, like the mouth of a horn, and named infundibulo-colic. This fold serves to fix the sigmoid flexure in its circular position.

The Intersigmoid Fossa.— Close to the bifurcation of the common iliac artery is the orifice of a fossa, which is limited below by the sharp falciform border of a serous fold formed by the peritoneum which passes from the pelvis. This fold has its concavity directed upward The two horns, right and left, are lost upon the inferior layer of the mesocolon in passing over the iliac vessels and left ureter. The sigmoid vessels emerge from beneath the fold to be distributed over the meso. The orifice admits one or two fingers. The canal is conica^l and is 6 or 7 cm. deep. Its location corresponds with the articulation of the fifth lumbar vertebra with the sacrum. It is not between the two layers of the sigmoid meso but between the meso and the parietal peritoneum.

Pathological Anatomy.—A rare hernia; based on two cases. In one ca‘e the hernia formed a large tumor. The great omentum covered the sac, which was situated to the left, above the sigmoid flexure. The great intestine surrounded the tumor. In the second case the sigmoid flexure was displaced towards the median line. The pyriform sac had a diameter of three inches. In the first case all the small intestine, except one-third of the duodenum and the last centimetre of the ilium, were contained in the sac. In the second case about six inches of the ilium were herniated.

VI.   Hernia Throuh the Hiatus of Winslow.

Pathological Anatomy.—The orifice of the sac is the hiatus of Winslow, the borders of which may be thickened and inflamed. Very rarely the small intestine is herniated. The great intestine is most frequently found in this hernia; also the cæcum and omentum.

In most cases the gut was strangulated either by an accessory orifice or by the abrupt bend of the intestine at its entrance to the hiatus, or by the hiatus forming a thick resisting collar.

Etiology —The causes of retroperitoneal hernia are almost unknown. It is more frequent in men than in women, and in adults than in children. According the Treitz it is always acquired, never congenital. He gives the following causes.

1. The abnormal looseness of the peritoneum in advanced age, after

emaciation, after pregnancy, after a rapid disappearance of ascitic fluid.

2 Efforts of respiration, micturition, defecation, any increase of abdominal pressure.

3. The overdistention of the intestine by gas or aliment.

4. The jarring of the body in walking, dancing, horseback-riding, etc.

Symptoms.—All retro-peritoneal herniæ may be classed in four groups:

1. The herniæ which are met by chance in the dissecting room, and which form the great majority of cases. The lack of clinical information in these cases does not permit of suppositions as to the troubles which they may have determined.

2. The herniæ which do not manifest their presence during life except by slight digestive trouble.

3. The herniæ which give rise to chronic intestinal obstruction.

4. Finally, the herniæ which manifest their presence in the appearence of some uncertain trouble, and later on approach the nature of acute intestinal obstruction, rapidly fatal, after having presented the characteristic picture of internal strangulation.

a. With slight gastric and intestinal disturbance. Habitual constipation; vague pains in the abdomen; colic; dyspepsia; all the digestive troubles which are dependent on dilatation of the stomach, gastric and intestinal catarrh. In cases in which the sac allows the intestine great mobility, and with a large orifice, the symptoms may be latent throughout the patient's life. But often, on account of some modifica tion of the peritoneum or angulation in the intestine, the hernia becomes the seat of strangulation, may be chronic, or acute and rapidly fatal. During the latent period by careful physical examination we may often discover the trouble.

Two classes of these herniæ, especially in reference to the duodenal variety, which is much the most frequent, may be considered, the small and voluminous. The small hernia is apt to be accompanied only by the slight troubles, and to remain unknown, unless by some complication it is changed sufficiently to reveal its presence. The voluminous hernia of this class, accompanied by a train of symptoms slightly pathog-

nomonic, may permit the clinician to suspect if not to discover it. Leichtenstern described an elastic, circumscribed tumor, in the umbilical region, cylindrical, and giving the idea of a large cyst; not very mobile, and extending from the umbilical region to the left. The fact that the percussion of this tumor gave a clear sound, that auscultation revealed intestinal bruits, the existence of hæmorrhoids and rectal hæm orrhages, on account of compression of the inferior mesenteric vein, enabled him to make a diagnosis.

The knowledge of the possible existence of these herniæ in the latent state will permit, in certain cases, the bringing into account this affection in the diagnosis of abdominal tumors.

b. With symptoms of chronic strangulation, the onset is always slow and insidious. The case of Strazewski suffered six months with pains about the umbilicus, of frequent diarrhœa, alternating with obstinate constipation, nausea, vomiting, anorexia. In the case of Majoli, the constipation and slight attacks of pain preceded ten months the appearance of the tumor. In the case of Strandenmayer the onset was sudden; having previously been well, the child suddenly was seized with violent pain in the umbilical region. The functional troubles are the same as in all partial obstructions. Coming on more or less violently are colic, vomiting, difficulty in evacuating the bowels, sometimes resembling complete obstruction. The pain is seated in the umbilical or epigastric region.

In Majoli's case of hernia through the hiatus of Winslow, the tumor protruded the abdominal wall of the epigastrium. Palpation revealed a resisting body, 6 cm. long, and having a vertical diameter of 3 cm., slightly painful, and having the form of a large potato. Percussion showed an exaggerated tympanitic note all over the abdomen except in the epigastric region. The tumor was formed by the transverse colon, and contained an accumulation of fæcal material, or an invagination of the gut. In the case of Strandenmayer the maximum pain was confined to the left abdominal region. The abdominal wall was protruded at the left hypochondriac region, corresponding to an area of resistance, loosing itself behind the costal arch. This region was tympanitic. A day later the tumor was more resistant, slightly pain-

ful, and still tympanitic. It was above and to the left of the umbilicus. The pain was always most pronounced over the most prominent part of the tumor.

About the sixteenth day of the trouble, a second tumor appeared at the extreme lower part of the original mass, the appearance of which coincided with rectal tenesmus. The autopsy revealed an invagination situated in the front part of the hernial sac. A fact of no small importance is the development of a large collateral vein on the abdominal wall between the epigastric and mammary veins.

In an analogous case, the abdomen was depressed in the stomach and umbilical regions, and along the line of the colon. In the region of the umbilicus was a tumor, the size of a child's head, nearly spherical. It was firm, easily depressed, slightly movable, not displaced by the movements of respiration, not adherent to the abdominal wall, slightly fluctuating. The hæmorrhoidal veins were greatly dilated. While the functional troubles were present, in the form of attacks of vomiting or constipation, the tumor was painful, heavy, and formed a visible protuberance. Inversely, as the functional troubles subsided, there was a diminution in the size of the tumor. In the latter days the strangulation became complete, the tumor was greatly increased in size, and was the seat of violent pains.

In these three cases of chronic obstruction the terminations were fatal in thirty, forty and fifty-three days.

c. With acute intestinal strangulation.

These cases present the general symptoms of acute intestinal obstruction. In duodenal hernia the pain is located about the umbilicus or epigastrium; vomiting, intermittent and fæcal; hiccough; complete constipation; etc. Peri-cæcal hernia gives right iliac pain. Intra-sigmoid hernia gives left iliac pain. Hernia through hiatus Winslown gives epigastric pain about the ensiform cartilage.

DIAGNOSIS.—In the cases with chronic obstruction the diagnosis is not difficult. The functional disturbances, with the tumor, render diagnosis easy. The chief factors in the diagnosis of cases with acute strangulation are the localized pain and the circumscribed tumor, with the symptoms of acute obstruction. In all cases exploratory laparot-

omy is indicated for the sake of precision of diagnosis, and relieving
of the trouble at the same time.

TREATMENT.— If the abdominal tumor is absent, and if the pain is
diffuse; if the symptoms are those of chronic strangulation with alter-
nating crises and remissions, and a precise diagnosis of the seat of
strangulation can not be made, the exploratory incision finds its ap-
plication. If the strangulation is acute, immediate median laparotomy
is called for. When retroperitoneal hernia clearly manifests its pres-
ence and location, incision of the abdominal wall on its level is indi-
cated.

The incision should be made in the epigastrium, for hernia through
the hiatus of Winslow; in the umbilical or left hypochondriac region,
for duodenal hernia; in the right or left iliac region, for pericæcal or
intersigmoid hernia. If the tumor is concealed, if the external signs
do not permit of diagnosis of the variety, let median laparotomy be
done.

Two obstacles very frequently present themselves to the surgeon in
operating for retro-peritoneal hernia: (1) The impossibility, even
though the obstructed gut be disengaged by a simple twist, of de-
stroying the ring, which remains a source of danger of recurrence; (2)
and the impossibility of relieving the strangulation, and the necessity
of abandoning the only resource of curing the disease, on account of
the great vessels which render section of the ring so dangerous.

JAMES P. WARBASSE.

BRYANT ON INTERNAL INTESTINAL STRANGULATION AND OB-STRUCTION.[1]

On retiring from the chair of the Harveian Society in January last, Mr. Bryant made some practical remarks on the treatment of internal intestinal strangulation and obstruction. Considering the subject from a clinical standpoint, he divided his cases into three main groups. 1. Cases of what he considers to be wrongly called acute obstruction; 2. Cases of chronic colonic or rectal obstruction and of acute symptoms grafted upon the chronic; 3. Cases which can not well be placed in either of the two former groups, and the nature of which is obscure.

With regard to the *first group*, the speaker had on a previous occasion called attention to the expediency of separating cases of acute intestinal strangulation from those of obstruction, since in the former obstruction is only one of the symptoms, but neither the cause of danger nor of death, whereas in the latter class of cases obstruction is the prominent and dangerous feature, and from it, or it chiefly, the consecutive changes which lead to death are brought about. The pathological changes undergone in all varieties of intestinal strangulation are identical; in all there is a more or less sudden or complete interference with the venous circulation of the part and this, if not relieved, will of necessity end in complete blood-stasis, and as a consequence, "static gangrene" and death of the part strangulated; death under these circumstances taking place from these pathological causes and not from obstruction. Obstruction may however persist for days or weeks after all the symptoms of acute strangulation have subsided without giving rise to a single bad symptom.

In the presence then of a case of acute strangulation—whether it be due to an internal hernia, volvulus, strangulation by a band or acute intussusception—the venous congestion gradual or rapid of the strang

ulated part, passing on to a more or less rapid complete blood stasis, should be remembered, together with the probable consequent death of the strangulated bowel if not of the patient; for it encourages the prompt adoption of operative measures and the rejection of temporization.

If a patient, presenting the symptoms of acute intestinal strangulation, be the subject of an old hernia, the rule of surgical practice is to explore the hernia, whether it presents the local features of strangulation or not, and if this produces no result, exploration of the abdominal cavity should follow. If no external hernia be found, the exploration should be attempted at once, first, to discover the exact cause of the strangulation and, second, to relieve it. As cases are seen of irreducible hernia in a condition of obstruction as well as of strangulation and as these conditions are indicated by general symptoms which vary only in intensity, so are cases found of internal hernia or its equivalent under precisely similar circumstances, and these different conditions are indicated by different symptoms. There are in both cases, degrees of strangulation; in one case it may be so sudden and complete as in a few hours to bring about blood stasis in the portion of the bowel implicated; and in another the strangulation is more slowly effected, and two or three days may elapse before the strangulated intestine undergoes any serious organic changes; while between these two extremes there are also many degrees.

This variation of degree shows how it is that in the most acute cases, besides the sudden onset of the symptoms, accompanied with vomiting of a persistent and gushing character, early collapse and speedy death occurs; and how it is when the process of strangulation is less complete and more gradual, the general symptoms are less severe, the vomiting less marked and persistent, and the collapse more or less absent until the close of the case. A case of scrotal hernia of the congenital variety in a young man æt. 26 terminated in gangrene of the whole strangulated bowel in twenty-four hours, and a coil of bowel in a young woman about the same age, which had become strangulated by a peritoneal band clipping the coil at the brim of the pelvis, became gangrenous in the same period. In both of these cases

operation proved useless, because undertaken too late relatively to the amount of changes which had taken place in the strangulated tissues. A portion of bowel, acutely strangulated within the abdomen, is no more likely to relieve itself by natural processes than is a strangulated coil in an external hernia; although this may occur in very exceptional cases, a conscientious surgeon would not endanger the result of ultimate operation by delay. For a loop of bowel, when only nipped by a band or partially strangulated like an obstructed hernia, passing on to strangulation, may suffer but little frome some hours' delay, or may even find an escape by natural processes when well aided by art.

Continuing the simile, in the most severe cases of acute strangulated hernia, even taxis may be injurious, nothing but operation being proper, while in the more slowly developing cases, taxis is the correct treatment and operative delay not censurable. Similarly in acute internal strangulation, nothing but laparotomy should be entertained; whereas in the cases of slower development a few hours may be spent in verifying diagnosis and in the employment of measures which may tend toward good. There should then be no delay in performing laparotomy as soon as the diagnosis of acute intestinal strangulation is made.

The *second group*, which includes chronic obstruction of the rectum or colon from cancerous, syphilitic, tubercular or simple ulceration, is, as a rule, susceptible of easy diagnosis. The digital discovery of growth or ulceration when the disease is low down, and the ballooning of the rectum, when it is higher up, together with the history of the case and other symptoms, afford ample evidence; and when the diagnosis has been made the line of treatment is simple and certain, consisting of the use of laxatives to ward off symptoms of obstruction, and a well regulated diet, with colotomy—lumbar if possible—as soon at least as the first symptoms of impending blockage appear; and in time to anticipate those further changes in the bowel above the seat of obstruction upon which depends to such an extent the mortality of all cases of obstruction, as well as so many of colotomy. Some difficulties in diagnosis may be due to the addition of acute to chronic symptoms, but such cases rarely if ever simulate those of acute strangula-

tion, and under such circumstances some delay for purposes of investigation can generally be sanctioned as long as a line of expectant treatment such as will be considered presently, and which is not calculated to do harm, is steadily pursued.

The diagnosis of the *third group* of cases is somewhat obscured because of the great variety of cases included in it, comprising, for purposes of treatment, cases of the first group in which operative delay is justifiable from doubtful diagnosis, or necessary from want of consent or other cause; cases of the second group in which acute symptoms have been grafted upon the chronic; cases of fæcal impaction of the cæcum or colon; cases due to some local peritonitis, the result of injury or the extension of local inflammation from a pelvic or other organ; cases of chronic intussusception or of early stricture; cases in which the diagnosis of internal strangulation is not sufficiently clear, or of colonic obstruction from stricture sufficiently virulent, and yet in which symptoms of obstruction are markedly present—that is to say, abdominal pain exists in various degrees with more or less abdominal tenderness and distension. Peristalsis may or may not be visible—if very visible it suggests chronicity. Vomiting may be present or persistent, and this is aggravated by food. Constipation more or less complete or prolonged may co-exist, and a repeated examination of the rectum fails to give any evidence of local disease.

Mr. Bryant, in these cases, is opposed to the administration of purgatives and enemata, of steadily increasing power, to the use of the long tube for washing out the large bowel, to the prolonged inversion of the patient and succussion and manipulation of the abdomen under anæsthesia; in cases diagnosed as colonic obstruction from fæcal impaction, purgatives and enemata may possibly be considered right by some, although he does not; in probable cases of organic stricture they are unquestionably wrong. He prefers a routine treatment, consisting of the recumbent posture, with elevation of the pelvis, abstention from all food by the mouth, rectal alimentation, the external use of belladonna and glycerine, and the administration of belladonna and opium to check peristalsis and soothe pain. He reports three typical cases treated by this method, as seen in the accompanying table:

TABLE OF ILLUSTRATIVE CASES OF THE THIRD GROUP.

Name.	Sex.	Age.	Symptoms.	Treatment.	Result.
Mrs. B.	F.	60	After a prolonged tendency to constipation, a distended, tender and tympanitic abdomen showing central coils of gut in a marked manner; frequent vomiting of a bilious character—aggravated by food—and complete constipation for ten days. Pulse feeble. Temperature subnormal. Rectal examination negative *Stricture of large bowel high up suspected* in the beginning.	Abdomen covered with a mixture of extract bellad drachm, i, and glycerine, oz. i; a nutrient enema, oz. iv, alternating with a nutrient meat suppository every four hours, and drachm, i of warm water by the mouth every half hour.	Relief to pain and all symptoms soon followed; some flatus on fourth day. Some grayish feculent matter on sixth day. After a glycerine enema on the seventh day a moderate stool; feeding by mouth resumed. Cure by fourteenth day.
J. G.	M.	32	Ill four days, constipated for seven. A dose of castor oil three days caused vomiting, followed by straining and passage of blood and mucus from bowels, but no fæces. Since then, abdominal pain of paroxysmal character. No lumps could be felt; rectal touch negative. *Intussusception suggested* by symptoms in the beginning.	Rest in bed. Water, drachm i, every half hour per orem Nutrient enema alternating with a meat suppository every four hours, the first enema also containing tinc. opii gtt. xx. Blood and mucus passed during next twenty-four hours seven times with tenesmus, but no fæces. Enemata continued but each containing tinct. opii, gtt, xx.	Liquid stool with flatus on fourth day, with relief; same on fifth day. Some solid motion came away, but with a blood clot on the tenth day and in three weeks the abdominal symptoms had disappeared. Probably would have resulted differently under old lines of treatment.
A. B.	F.	19	Some weeks difficulty in obtaining relief from bowels, followed by complete obstruction ending in abdominal pain, distension and tenderness with vomiting. Not even flatus has passed for eleven days. Vomiting persistent. Palpation and rectal touch negative. Temperature normal.	Belladonna application as with Mrs. B. Nutrient enema of egg and milk, oz. iv, alternating with a meat suppository every 3 hours, with drachm i of fluid per orem every half hour to relieve thirst.	Abdomen less tense and painful on second day; vomiting ceased. Still better on fourth day, so a few ounces of thin broth were allowed. Bowels acted on fifth day and continued to do so when an enema was given to clear out the rectum of the solid motion which had passed down, and a rapid recovery ensued.

The results of the treatment illustrated by the cases tabulated were satisfactory and better than any that would have followed the use of powerful purgatives, large enemata or abdominal taxis; moreover, the treatment was simple, and though expectant, it did no harm. It may reasonably be said of such treatment that in the only class of cases to which it is applicable—those of a not urgent but doubtful nature—it gives time for the case to develop and the surgeon to frame a more exact diagnosis; while it leaves nature every chance of correcting, where possible, any error in the abdominal machinery. Should this treatment fail in any case to speedily relieve the symptoms, more active measures may be resorted to as soon as a clearer working diagnosis has been made.

Opium may sometimes be given more freely than in the tabulated cases, but where belladonna applied externally arrests peristalsis and soothes pain, opium is not needed. It is, however, of great value in many cases, and the preferred form is solid opium or the bimeconate of morphia. It should always be given with caution, and preferably with belladonna as a suppository made with gelatine—half a grain of the extract of belladonna and half a grain or more of solid opium. Warm fomentation to a swollen abdomen often gives comfort, and should, when used, be applied over the glycerine and belladonna application—one drachm of extract of belladonna and one ounce of glycerine. Relief has been known to follow the elevation of the pelvis on a firm pillow, so as to allow gravity to act toward the thorax, in a case of obstructed bowel from a supposed band.

Mr. Bryant claims no novelty in the treatment he advances. The principle upon which it is based was first recommended by Sydenham, re-introduced by Brinton and more recently enforced by Thomas, with some modifications; he only desires to emphasize its value in the hope that it may supersede the routine practices, which he condemns and which have too long occupied the field.

James E. Pilcher

REVIEWS OF BOOKS

I. PRINCIPLES OF SURGERY. By N. Senn, M.D., Ph. D. (Milwaukee, Wis.) Roy. octavo, pp. 611. Philadelphia and London, F. A. Davis, Publisher, 1890. St. Louis, J. H. Chambers & Co.

The development of surgical pathology, the growth of bacteriology, and the unwonted activity in the study of the etiology of surgical diseases during recent years has so transformed the principles of surgery as to leave in a state of benighted ignorance the student of twenty years ago, who has not kept pace with later advances. In this book Dr. Senn has collected into available form the results of the labors of the most advanced pathologists. That a large portion of his space is given to the German school goes without saying, for the pathologists of that nation are in the lead to-day; but the work of all schools has been carefully collated, and the result is a treatise, singularly judicious and moderate, although withal suitably dogmatic in tone.

The book naturally groups itself into five principal parts; the first is occupied by a discussion of regeneration and inflammation, the second considers pathogenic bacteria, necrosis and suppuration; a third group includes septicæmia, pyæmia, erysipelas, tetanus and hydrophobia; a fourth part is concerned with tuberculosis in its surgical aspects, and the remainder of the work comprehends actinomycosis, anthrax and glanders. The space required for the consideration of the very important subject of tumors being so large, and the work having already become so voluminous, the author decided to reserve his discussion of them for a separate book; his decision in this respect is to be regretted since the omission not only mars the symmetry of the work, but renders its title misleading.

The author's treatment of the first group is noteworthy on account of his discardal of the theory of immediate union of wounds, substituting for it the idea that a certain amount of coagulative necrosis takes place in every wound, and the material thus formed serves as a cement substance which temporarily glues the parts together.   *   *   * This mechanical union, the result of destructive chemical changes in the extravasated blood, is the form of union which has been wrongly interpreted and described as immediate union."

Regeneration of tissues is comprehensively considered, an excellent account of Thiersch's method of transplantation of skin being included in two chapters on the subject.

The central feature of the book is the micro-organism, although, as many playwrights do not formally introduce their hero until the second act, the author retains the introduction of microbes until the second of our groups, which opens with a chapter (Chap. V.) on "pathogenic bacteria."   The culture of bacteria is succinctly presented in an eminently useful manner.   For the benefit of the busy practitioner, who lacks the time and opportunity for the preparation of the culture media used in laboratories, he describes the substitution of sterilized potato or bread-paste media, which are readily prepared with the appliances which should be in every physician's office.

With regard to the mooted question of the existence of pathogenic microbes in the healthy body, Dr. Senn believes that they "may and do exist   *   *   *   without necessarily giving rise to disease, especially if, as is well known, they are constantly being eliminated through the excretory organs," and that the "conditions, then, upon which depend the preservation of health in the event of the entrance of pathogenic microbes into the body, are: 1. The number of microbes introduced   2. Absence of a *locus minoris resistentiæ*.   3. Active elimination through the excretory organs."

Microbic disease, he remarks, is transmitted from parents to unborn children; both clinical observation and experimental research leaving no room for doubt that in some infectious diseases, at least, heredity is traceable to direct transmission of the specific microbes, either by means of transportation by the spermatozoa to the ovum, or by their

entrance through the thin wall which separates the maternal from the fœtal circulation.

Agreeing with the tendency of the day, he abandons the old restriction of the word "necrosis" to the death of bone only, and extends as well to soft parts where the dead structures do not undergo putre· faction.

The presentation of the microbic origin of suppuration is remarkable for clearness and definiteness of statement, as well as for the thoroughness with which essentials have been separated from accessory details. Clinical observation and experimentation during the last twenty years has well established the fact that pus-microbes are the immediate and essential cause of suppurative inflammation and pus formation, and that these results can be avoided by measures which are calculated to remove, destroy or exclude pathogenic micro·organisms. The staphylococci pyogenes aureus, albus and atreus, the staphylococci cereus, albus and flavus, the staphylococcus flavescens, the micrococcus pyogenes tenuis, the streptococcus pyogenes, the bacillus pyogenes fœtidus and the bacillus pyocyaneus are described and illustrated, and their relation to ptomaines considered.

In connection with suppuration in bone, he remarks that when primary it begins in the medullary tissue; "hence it is not correct to speak of a suppurative ostitis, as is so frequently the case among English and American authors. Primary suppurative periostitis is an exceedingly rare affection; consequently *osteomyelitis* must be considered as the most frequent of all inflammatory diseases of bone." He is a strong believer in early operation in the latter malady, considering that while it would be a serious and unjustifiable mistake to open a healthy medullary cavity, it would also be next to criminal negligence to wait for fluctuation before resorting to operative treatment in a case of acute osteomyelitis.

In cases of suspected cerebral suppuration, he recommends the use of the exploring needle for finally deciding the location of the pus focus, considering the procedure absolutely free from danger. A case in which the writer saw exudation of blood and resulting fatal compression follow the accidental puncture of a cerebral vessel, while using an

exploring needle, as Dr. Senn advises, has caused him to believe that exploration should be conducted with more caution than has been the custom.

Septicæmia is considered to represent a febrile condition brought about by the absorption from a local focus of different toxines from as many different microbes. The author discriminates between septic intoxication and septic infection, attributing the former to the absorption of a pre-formed ferment or toxine, which produces the maximum result as soon as it reaches the circulation; and the symptoms subside with the arrest of further supply and the elimination of the septic material from the circulation; septic infection, however, is due to the introduction into the circulation of living micro-organisms which multiply with great rapidity in the blood, a circumstance which imparts a progressive character to this form of septicæmia.

He considers the identity of the tetanus of lower animals with that of man firmly established by Koch's demonstration of the identity of their micro-organisms; inoculation experiments have added still greater weight in favor of this opinion. Hydrophobia he places in the same category, attributing it to an as yet undiscovered microbe.

Tuberculosis in its surgical aspect receives here by far the most complete consideration that has yet come under our observation. The bacillus tuberculosis is fully described and its habits and characters rehearsed. The clinical forms are exhaustively considered, comprising tubercular abscess, tuberculosis of the internal ear, the iris and the skin, in connection with the latter bringing out fully the tubercular character of lupus. Tuberculous infection of the lymphatic glands and peritoneum, of the bones and joints, of tendon sheaths, fascia, the mouth, the breast, the bowels and the genito-urinary organs is gone over in detail.

Dr. Senn's brilliant and incisive style is too well known to readers of modern surgical literature to demand especial notice here. The present work affords a superb illustration of his art of clear presentation. Conclusions are made still more conspicuous by the use of italics. The book is a notable example of the careful, painstaking work which we expect from its author, and of which he so clearly expresses his

opinion when applied to operative surgery: "Brilliant surgeons are not always the best surgeons. The best results in surgery follow the one who is most painstaking in following out the minutest details.

<div align="right">JAMES E. PILCHER.</div>

A GUIDE TO THE INSTRUMENTS AND APPLIANCES REQUIRED IN VARIOUS OPERATIONS. By A. W. MAYO ROBSON, F.R.C S., England. Surgeon to the Leeds Infirmary, Lecturer on Practical Surgery at the Yorkshire College, etc. London, J. & A. Churchill. St. Louis, Mo., J. H. Chambers & Co., 914 Locust Street.

The type of a certain class of misadventures to which the surgeon is liable is to find in the middle of performing an amputation far away from home that the saw has been forgotten. But there are many misfortunes less than this from which he will be protected who makes use of the admirably and accurately made lists of Mr. Mayo Robson. By personal experience we have found them very reliable. They are compiled by a practical man well versed in antiseptics. The book is small, and easily carried in the pocket if required.

<div align="right">C. B. KEETLEY.</div>

SCHEME OF THE ANTISEPTIC METHOD OF WOUND TREATMENT. By DR. ALBERT HOFFA. Privatdocent in the University of Würzburg. Translated from the German, with additions, by special permission of the author, by AUG. SCHACHNER, M.D., PH.G. (Louisville, Ky.)

Louisville, The Bradley & Gilbert Company, 1890. St. Louis, Mo., J. H. Chambers, 914 Locust Street.

The author has arranged in tabular form, for ready reference, an abstract of the entire subject of antiseptic and aseptic treatment. It forms an excellent remembrance and a most valuable help to the recollection of the minute details so necessary to the attainment of a perfect result and so liable to be forgotten. The translator has put the matter into correct idiomatic English and has completed it by a number of additions. JAMES E. PILCHER.

DIE VERLETZUNGEN UND CHIRURGISCHEN ERKRANKUNGEN DER PERIPHERISCHEN NERVEN. VON DR. T. KOLLIKER, [Privatdocent in Leipzig] Deutsche Chirurgie, Lieferung, 24 b, Stuttgart, 1890.

THE INJURIES AND SURGICAL DISEASES OF THE PERIPHERAL NERVES. Price, 4M 80, about $1.20. St. Louis, Mo., J. H. Chambers, 914 Locust Street.

The field covered by the present number of this well-known encyclopedic work can be best indicated by its general headings. Literature (26 pages, and not perfectly complete at that); Anatomical Introduction, on the histology of the peripheral nerves (pp. 3); Injuries of Peripheral Nerves, including their surgical treatment (pp. 46); Foreign Bodies in Peripheral Nerves (pp. 3); Inflammation of same (pp. 9); Operations on Nerves, for Paralysis, Neuralgia, Tabes, etc , (pp. 40); Hypertrophies and tumors (pp. 19).

In this space the author has succeeded in giving considerable attention to even the many minor divisions of the subject. Although there is but limited scope for originality, it is very satisfactory to find that, in treating a department in the main of such recent growth, his evident

aim is everywhere to bring his work quite up to date, and into harmony with the results of experimental studies.

To cull out special facts and topics for notice is, perhaps, unfair, but space will not allow more. Dislocations, sudden or habitual, of the ulnar nerve, and even of the peroneus, have been observed. Injuries of nerves, without or with only partial division of continuity, have —in the absence of all sepsis and of any foreign matter—none of the dangers of complete division. After division of a nerve the stump does not retract like a tendon stump, in fact, the ends may even overlap. The recent conclusions of Friedlander and Krause that Waller's law of degeneration in severed nerves is so far incorrect that certain axis-cylinders (for sensory conduction) do not degenerate in peripheral portion, and that corresponding ones in the central portion do degenerate is pronounced by Kolliker, from his own experimental studies as well as from the anatomical investigations of his, to be entirely unwarranted. Hence, we may quote Waller's authority unimpaired.

In the regeneration of nerves (neurotization of Vanlair) the new axis cylinder grows out from the stump of the old one and is not formed from the sheath; the whole degeneration goes out from the central portion and is not actively participated in by the severed part. From the fact that regeneration from the stump and degeneration of the severed portion begin at about the same period after injury, as well as from certain experimental and clinical experience, he acknowledges that mediate and immediate primary reunion of severed nerves is possible, though as yet not proven, and in practice very unusual. Of great importance in prognosis is the length of the severed portion of the nerve; the shorter this, the more speedily and certain the regeneration. and *vice versa.* Suppuration of the nerve, or formation of broad, deep cicatrices make the prognosis especially bad.

As to sutures he gives the paraneurotic the preference in most cases, the direct suture being. perhaps. admissible where there is tension. For suture material catgut is best, except again where there is tension when fil de Florence may be preferable.

A consideration of the various methods for overcoming defects—when not over 3 or 4 ctm. stretching of one or both stumps often suffices—leads him to prefer Assaky's substitution of strands of cat gut, or as more ideal yet the tubular suture of Vanlair (with Neuber's decalcified bone tubes).

The subject of neuritis, acute or chronic, inflammatory or degenerative, local or multiple, is admirably reviewed, though briefly, as be coming an affection but partially surgical.

The more strictly surgical nerve troubles, with the various indicated operative procedures (neuralysis or freeing a nerve from com pression, neurotomy or nerve stretching, neurotomy, neurectomy and neurexairesis or nerve extraction), are very comprehensively considered.

As this field is frequently considered in American articles, it is not necessary to review the various points more fully.

WILLIAM BROWNING.

CYSTS OF THE URACHUS (CONGENITAL CYSTS, EXTRA-PERITONEAL CYSTS, OR DILATATION OF FUNCTIONLESS DUCTS).

By FRED BYRON ROBINSON, M.D.,

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THE urachus of man is ordinarily a solid fibrous cord extending from the summit of the bladder to the umbilicus. It is the remains of a transitory, functional, fœtal structure. It is the stalk of the allantois or that part of the allantois which remained inside the pleuro-peritoneal cavity after closure of the visceral folds which constitute the abdominal wall. The internal and external parts of the allantois become constricted and finally divided at the umbilicus. The urachus continues its existence in post-natal life as the suspensory ligament of the bladder. It is not unlike many other fœtal structures or acquired abnormalities which exist, and occasionally become pathological, at the points where the opposite halves of the body coalesce. The allantois springs out of the pleuro-peritoneal cavity before the visceral plates coalesce. It grows wider and longer until the distal part of its sac blends with the most external fœtal envelope—the chorion. The allantois conveys the blood vessels from the embryo to that part of the placenta which is in contact with the endometrium, where the fœtal and maternal circulation establish their relations. In the chick it is easily seen and acts as a kind of lung to aerate the blood. In the early fœtal calf I found the most typical allantois to study. Now, the distal part of the allantois or that part outside of the pleuro-peritoneal cavity soon fulfils its function and shrivels away as far as the umbilicus where the closing visceral plates have constricted it. The

proximal part of the allantois—the stalk—or that part inside the pleuro-peritoneal cavity, still persists. This persistent stalk of the allantois finally forms the urethra, bladder and the *urachus.* The urachus is an even calibred tube, reaching from the cloaca to the umbilicus during considerable fœtal life. During very early fœtal life the urachus is the receptacle for the excretion of the pronephros, or man's first kidney, whose excretion is carried to the urachus by the duct of Müller. Later the urachus, slightly changed, receives the excretion of the mesonephros, or man's second kidney, by way of the Wolfian duct. Finally, the urachus, considerably changed in shape, receives the excretion of the metanephros, or man's third kidney, by way of the ureter. The urethra and bladder are the only functional parts of the stalk of the allantois in post-natal life; the remaining functionless part is known as the urachus. It is the white, hard, fibrous cord seen stretching from the bladder to the navel, and lying between the two functionless, fœtal hypogastric arteries. It, of course, must be remembered that the urachus lies outside the peritoneal cavity, as do all viscera.

From the extra-peritoneal character of the urachal cyst arises the first puzzle in the operation, as the surgeon cannot find the anterior parietal peritoneum; it is displaced backward.

Cysts of the urachus are congenital or acquired. Both varieties are occasioned by an unclosed duct. The acquired cyst may, so far as I have seen, arise at any period of life, up to 45 years of age, and I know no reason why it cannot occur at any age. It appears that the unclosed cavity in the urachus may remain dormant for years, and then take on pathological condition. Any part of the urachus may dilate, but the part next to the bladder seems the most liable, as that is the last portion to become functionless.

The frequency of cystic dilatations of the urachus is difficult to estimate. I examined some 40 sheep, but did not notice a trace of a dilated urachus. In examining the pelvic organs of 150 sows, I was wonderfully impressed how much the sow was subject to most kinds of cystic dilatations. Cystic ovaries were astonishingly common. Dilatation of the mesonephritic tubules and Gartner's duct were frequent. Dilated cysts of the broad

ligament were often seen, but these are likely dilated lym-
phatics. Cysts of the urachus in the sow are quite rare, but
we can observe that the urachal cord is uneven in thickness,
and no doubt from these little bulges occasionally arise the
cysts. However, I did not see a cyst as large as a bean in
150 sows.
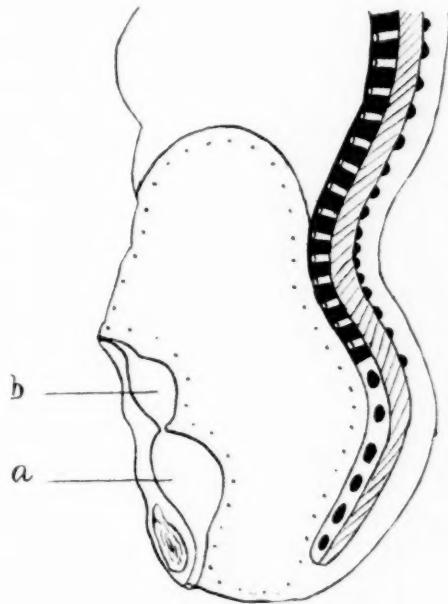
FIG. 1.—URACHAL CYST OF A 10 YEAR OLD BOY FROM POST-MORTEM.

a. Bladder.
b. Urachal cyst.
The dotted line represents the peritoneum.

But it was quite a different matter in the fœtal pig, of which
we examined about 30. In the very early fœtus the bladder
was elongated, and it was frequent to see cysts which one
could easily record as urachal cysts, but no doubt they rap-
idly close in late fœtal life. In examining some 60 cows I
saw no urachal cysts, though the cow is quite subject to cyst-
oma of the ovary and the functionless ducts of the broad liga-
ment (especially Gartner's duct). In a big bull I noticed that
the urachus toward the bladder was quite thick.

In experimental intestinal work on dogs, I carefully post-
mortemed about 175, but did not see one case of dilated
urachal cyst. I worked several years in dissecting rooms, pay-
ing special attention to visceral and pelvic anatomy, but did
not see any urachal cyst in but one autopsy; which is repre-
sented in figure 1. Yet I saw much variation in the appear-
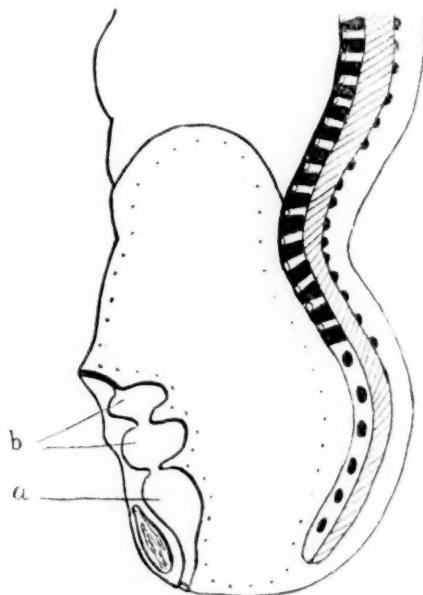
FIG. 2.—MULTIPLE URACHAL CYST.

a. Bladder.
b. Urachal cysts.
The dotted line represents the peritoneum.

ance of the urachal cord. Meckle and Hoffman each report
urachal cysts in pigs. Meckel's case showed a cyst an inch
in diameter, and Hoffman's looked like a double bladder. J.
Bland Sutton has seen a urachal cyst in a mole. However,
the best method to study urachal anomalies is to examine a
large number of the embryos of the pig and cow in all stages
of uterine life. Then it is instructive to examine these same
kind of animals immediately after birth. So far, I have been

unable to examine the urachus of a horse. But both **Gurlt**
and **Freer** give excellent examples of urachal cysts in this ani-
mal. I understand from veterinarians that the horse is one of
the most typical animals to show urachal cysts, and that quite
late in horse fœtal life the urachus is found often quite a dis-
tance above the bladder.

The *perviousness* or patency of the urachus has been claimed
and disputed for more than a hundred years, but it has re-
ceived so slight systematic attention that we are not in posi-
tion to categorically state its distinct life-history, either fœtal
or post-natal. No doubt it may remain patent during fœtal
and adult life. However, at present we are all aglow with
views on visceral anatomy and medical colleges are wisely
establishing chairs in this department which will result in
much advancement. The searchers in visceral anatomy will,
by the aid of comparative anatomy, solve the evolution of in-
dividual visceral organs. Many good observers have recorded
urachal cysts in man. Mr. Treves, of London gives a case of
a man, æt. 40, who had a urachal dilatation of an inch in
diameter. The man had a stone in his bladder which was ex-
tracted by introducing the finger into the bladder by way of
the urachus and drawing the stone out through the uracho-
umbilical fistula. Mr. Jordan Lloyd, of Birmingham, England,
personally related to me while on a visit to him, that on sev-
eral occasions children have been brought to him with urine
escaping at the umbilicus. In these cases Mr. Lloyd had
demonstrated that they were uracho-umbilical fistulæ by pass-
ing a sound from the umbilicus by way of the urachus into the
bladder. The escape of urine from the umbilicus and the con-
nection of the tract with the bladder renders a patent urachus
positive. Dr. Freer, of Washington, D. C., gives the case of a
woman who came to him with a discharge of urine from the
umbilicus. She had been affected for a long time with a
chronic purulent discharge from the umbilicus which had
greatly exhausted her. A sound passed into the fistula its
whole length, and by moving the distal end of the sound, one
could feel that the cavity had a diameter of some three inches.
He washed out the urachal cyst. Its connection with the
bladder was demonstrated in two ways. First, when the

woman strained urine passed out at the umbilicus.   Second, a
solution of starch was injected at the umbilicus and the urine
drawn from the bladder, subsequently treated with iodine
when the characteristic blue iodide of starch appeared.   This
woman had been cured many times but had experienced as
many recurrences.   Curiously enough she found no difficulty in
making water *per vias naturales.*   Frequently persons afflicted
with urachal cysts experience difficulty in urinating at pleas-
ure and when they attempt to urinate the urine regurgitates
into the cysts.   The difficulty in urinating with a urachal cyst
is illustrated by a case collected by Dr. Freer.   A middle
aged woman could not urinate at pleasure for when she at-
tempted to make water the muscles of the bladder contracted
and drove the urine into the urachal cyst until it was full.   She
could then evacuate the urine by pressure of the hands on the
belly.   By the continuous pressure the urine was driven out of
the cyst into the bladder, whence the bladder, having the
escape of least resistance blocked, expelled it through the
urethra.   She became pregnant, and the enlarged uterus ob-
literated the urachal duct between the cyst and the bladder.
This obstruction in the vesicular end of the urachus confined a
considerable quantity of fluid.   As the enlarging uterus en-
croached on the cyst it produced so much disturbance that it
was decided to aspirate it.   The gestation ended without
further disturbance from the cyst.   Four years subsequent an-
other pregnancy again called for emptying of the cyst, which
was followed by abortion.   At this time the communication
between cyst and bladder became obliterated with final cure.

   The *Medical Record* of 1879 reports a case where a man
had pain and soreness around the navel.   The abdomen was
explored and a phosphatic calculus as large as a walnut was
removed from a patent urachus.   Dr. Helmuth reports a case
operated on which was fatal on the fifth day.   The woman
had been afflicted with a urachal cyst for forty-seven years.
Dr. Helmuth operated on her for ovarian cystoma.   On cut-
ting through the abdominal wall he came on to the urachal
cyst and incised it.   He introduced his finger and found it
communicated with the bladder.   The urachal cyst was pushed
aside and the ovarian cystoma behind it removed.   Dr. Hel-

muth stitched the urachal cyst-wall together as one would do the bladder walls in suprapubic lithotomy, but peritonitis ended the scene. Dr. Atlee reports a case of "urine cyst" and says it was "a purse in a dilated urachus." Dr. Thomas reports a case in the *Medical Record* of 1878, on which he operated successfully. Dr. Freer collected a case in which a student had a urachal cyst which finally killed him. Repeated tappings did not cure it. When he died the urachal cyst contained 100 pounds of fluid, while he himself only weighed 92 pounds. Dr. McLean, of Troy, reports a case of urachal cyst in connection with ovariotomy which proved fatal. The foregoing curt reports of cases show that the urachal cyst has been recognized by individual operators for twenty years. But it is the modern impulse given to biology and comparative anatomy that has so widely contributed to our knowledge of fœtal structures and their subsequent history in post-natal life.

I wish now to report the newer ideas and results which have resulted from the cultivation of laparotomy. In the department of urachal cysts Mr. Lawson Tait has been the real epoch maker. What he has taught in the past eight years about these cysts has been a revelation to the abdominal surgeon. For a long time these cysts puzzled me and I knew of abdominal sections which were neither intelligible to myself nor to others present. I have seen surgeons opening the belly in a bewildering manner from pathological conditions and lack of finding the peritoneum and it was still more bewildering when the belly was opened. They did not recognize the real condition of a urachal cyst, but called it a peritoneal abscess, or encysted peritonitis. Up to 1886 Mr. Tait had reported 14 cases, and I know of 4 more cases which I had good opportunities to observe during my six months' course with him. Of course Mr. Tait is liable to get these rarer cases as he taps the clinics of the globe for his material. In 1886 Mr. Tait read a report of 12 cases of urachal cysts before the British Gynæcological Society. To show that the subject of urachal cyst was really new five years ago when Mr. Tait read his paper, I will quote what Dr. Bantock said in the debate of the cases. Dr. Bantock said: "*The cases were of remarkable interest, but he feared there was not one who could discuss the subject from*

experience." Here is an operator, a prince among abdominal surgeons acknowledging his inability to discuss the subject only five years ago. He said, however, that Mr. Tait had called his attention to these cases by his paper and that he remembered having two cases which were likely of this same class. I will give one case in Dr. Bantock's own words as it is such an excellent picture of a typical case. "The first case was that of a married woman, æt. 30, and the mother of two children. On dividing the parietes I opened into a cyst containing 25 pints of thick grumous fluid with a very decided biliary tinge. When the whole of the fluid was removed the cyst was found to be unilocular, and looking down into the pelvis was like looking into one's hat, so completely did the walls of the cyst line the pelvic cavity. After separating what appeared cyst wall from the parietes on each side, and cutting away what was thus separated I recognized the hopelessness of proceeding further and I washed out the cyst with solution of iodine and closed the wound, leaving a drainage tube passing down to the bottom of the pouch. Although the separation of what was taken as cyst wall was carried beyond the umbilicus, the peritoneal cavity was not opened. A thick pultaceous fluid of the color of mustard came from the cavity for many weeks, and the patient was discharged quite well at the end of two months I lately saw this patient in perfect health. The source of the brilliant yellow color of the discharge is still a puzzle to me."

The second case of Dr. Bantock's is very typical and as he acknowledged he was at a loss to explain the relations of the cyst, as well as Dr. Amand Routh with whom he saw her, I will give the second case in his own words of debate. "The second case was that of a married moman æt 37, the mother of 3 children. The history told was that she was taken ill on January 10, last, with violent sickness and pain all over the 'stomach.' She was laid up and became feverish, the pain lasted, severe, for five days and the sickness two days, the abdomen gradually got larger and about the end of February, she was tapped of rather more than a gallon of thicked pale-yellowish fluid. In about a month more, she was again tapped to the extent of three pints of a thicker fluid and recommended

to apply poultices. Shortly after this the puncture-hole opened and discharge came away. She then presented herself at the out-patient departmant of the Samaritan hospital under the care of Dr. Amand Routh, with whom I saw her. There was a fistulous opening, about two inches below the umbilicus in the middle line, and an ordinary surgical probe passed in for its whole length. She was admitted into the hospital on July 20, and I thought I had to deal with a multilocular tumor of which a central cyst had suppurated, as on withdrawing the probe no discharge followed. On July 27, I divided the parietes by a double elliptical incision with the view of cutting out the fistulous track and was not a little surprised to find on completing the division on one side that I had opened directly into a unilocular cyst containing from 3 to 4 pints of purulent looking fluid. On further examination I found the same condition of things as in the first case and recognizing the unadvisability of proceeding further I thoroughly washed out the cavity with plain warm water and closed the wound, leaving in a glass drainage tube. The patient presented herself to the hospital 2 or 3 weeks ago in perfect health. In this case the uterus was low down, pressed forwards and fixed. I was as much at a loss to explain the relations and origin of this cyst as in the first instance, but I thought they were worthy of being related in connection with the very remarkable cases read by the President" (who was then Mr. Tait). Here are two unrecognized urachal cysts. Both are unfinished operations at the time by the best of operators but both recovered. Both women had borne children and the cyst wall bulged and projected into the pelvis in each case. Both presented the puzzling character of the cyst being out side the peritoneum and the operator could not find the peritoneum. Also that the cyst wall could not be removed. I would call attention to the idea in these cases, that though the urachal cyst filled the pelvis the ovaries and tubes performed their functions and the women bore children. Hence all the peritoneum could not have been displaced out of the pelvis, as there must have been sufficient left to hold the tube and ovary in relation to get an egg from the ovary down the tube into the uterus. Also that part of the peritoneum which covers ovary (the germinal epithelium) must have been left

undisturbed as ovulation progressed.   Right here I wish to
speak of the relation of the peritoneum to the urachal cyst.   I
understand from Mr. Tait's writings and remarks at these
operations during my visit with him, that he holds that the
peritoneum does not go down into the pelvis in some of the
cases.   He claims that the peritoneum in some cases is entirely
displaced from the pelvis or that it never was there.   Observe
that some of those cases to which this remark of Mr. Tait's ap-
plies were cases who have borne children.   His expressed views
are that the peritoneum leaves the anterior abdominal wall
where it comes in contact with the urachal cyst.   The peri-
toneum then passes backward and downward behind the
swollen cyst as far as the promontory of the sacrum where it is
reflected—not entering the pelvis.   It seemed to me to be a
necessity that the parous woman must have peritoneum in the
pelvis to make the ovaries of any use and for that matter the
tubes.   The ovaries cannot make normal ova without germi-
nal epithelium, and the germinal epithelium is a part of the
peritoneum covering the ovary.   It is also likely that the tube
cannot transmit an egg to the uterus without normal relation
of the peritoneum to the fimbriated end of the oviduct, for the
ovum is really first shed into the peritoneal cavity before it
even gets into the mouth of the tube.   When I called Mr.
Tait's attention to the view that a woman could not likely have
children without peritoneum holding some relation to the
ovary and fimbriated end of the oviduct, he replied that the
urachal cyst wall acted as peritoneum to tubes and ovaries.
To this I could not agree.   For, any part of the peritoneum is
not convertible into germinal epithelium which especially
covers the ovary.   Much less could a urachal cyst wall be con-
verted into germinal epithelium, and cover the ovary so as to
perform the new function of ovulation.   The peritoneum sur-
rounding the ovary is selective and it alone is endowed with
elective power for ovulation.   The germinal epithelium of the
ovary cannot transfer its authority to some other portion of
the peritoneum, much less to any cyst wall of a dilated function-
less duct.   The conclusion is therefore in the reproductive
woman that the dilated urachal cyst no matter how large is
superimposed on the peritoneum covering the ovary and on

sufficient surrounding the fimbriated end of the oviduct to allow the transmission of an egg to the uterus. This statement may seem strange when a vast urachal cyst will reach from pelvis to stomach but a little observation of the peritoneum will soon convince any mind that the peritoneum is endowed with an enormous capacity for stretching, particularly if that stretching be done very gradually. Beside slow gradual pressure will dissect off large tracts of peritoneum, thus giving it more opportunity to stretch.

However, it must be admitted that we have, so far, no conclusive, scientific *post-mortem* of cases in which the urachal cyst completely fills the whole pelvis and until such autopsy is produced with frozen section, we must wait for light. Hence I will drop the further discussion now.

Mr. Tait divides his cases of urachal cysts into two distinct groups. In the first part the cyst walls were tougher and could be separated from the other viscera. *The cyst wall did not dip into the pelvis.* They thus only partially displaced the pelvic peritoneum. They would only gradually dissect or strip off some peritoneum, according to the size of the urachal dilatation.

In the second group of cases the cyst wall *always dipped down into the pelvis.* The wall of the cyst was brittle, friable and gelatinous. Mr. Tait in this class of cases claims that there is no other kind of peritoneum in the pelvis than the urachal cyst, and that its walls act as a peritoneum. A peculiar flaky, shreddy substance like lymph shreds appeared in the cysts. In the second group of cases the relation of the lower peritoneum and the upper cyst wall was entirely different from the first group. The second group did not permit the extirpation of the cyst wall.

I wish to state that this article was finished up to this point some time ago and laid aside, but later I had a personal conversation with Mr. Tait on this subject in which I found I had misinterpreted his previous remarks and writings relative to the *peritoneum.* It might, at first glance, appear that the above two groups were simply examples of degrees of development of the urachal dilatations. I had taken this view of it, but Mr. Tait favors the view that the lower zone of the peritoneum

being developed out of the allantois, originally, has never con-
tracted into the small urachal stalk.   Hence it is therefore just
the same as the original peritoneum which comes from the
allantois.   The pleuro-peritoneal cavity in the cases where the
cyst goes down and fills the pelvis, will have two diaphragms
—the natural one and one at the umbilicus.   Or rather there
is constriction between the upper and lower peritoneal cavities.
In such cases a new partition is added which supports the in-
testines.   According to him, then, the lower zone of the pleuro-
peritoneal cavity is simply constricted in early fœtal life.   This
view of Mr. Tait is reconcilable with reproduction as there
would be germinal epithelium on the ovary and ordinary rela-
tions of the peritoneum to the tube to transmit an egg to the
uterus.   However, I must say that this cyst wall does not look
much like peritoneum to me, even after making due allowance
for pathological changes.   In the cases I saw it was thick as
sole leather, friable, brittle, gelatinous and reflected light when
it was tore or cut, just as jelly would.   I could easily stick
my finger through its cheezy, rotten walls, which would tear
off in little bits if one attempted to enucleate some of the cyst
from its bed.

Mr. Christopher Martin, Mr. Tait's assistant and myself did
some microscopical work on the Fallopian tubes of one of the
cases in which the urachal cyst wall completely filled the pel-
vic cavity.   The wall of the cyst wrapped itself around the
Fallopian tube just like a meso-salpinx.   The woman had
borne children.   On cutting the oviduct square across with a
sharp knife the naked eye could easily distinguish the urachal
cyst from the tubal wall.   There was a distinct line of demarca-
tion between the friable, gelatinous urachal cyst wall and the
muscular tube.   The wall of the Fallopian tube was thickened.
Its mucous membrane looked ragged and disorganized.   Un-
der the microscope, in the cyst wall, one could see a mesh
work of fibrous connective tissue; considerable non-striated
muscular fibres appeared.   Some tubercles with giant cells
were visible; also some fat.   Sparsely scattered through the
cyst wall was some substance which appeared to me like cal-
careous deposit.   On the interior of the urachal cyst wall I
could not make out the epithelium with sufficient distinctness

to describe it. The walls also showed an extra number of large
blood vessels well filled. I rather thought we would find the
peritoneum between the exterior of the urachal cyst wall and
the Fallopian tube. But I could find nothing definite. The
cyst wall and the tubal wall had so intimately blended that all
I could see definitely was a line of connective tissue. Now, by
stripping off the urachal cyst wall from the tubal wall in many
places a shiny surface could be plainly seen with the naked
eye. This appeared to me to be the peritoneum. At least, in
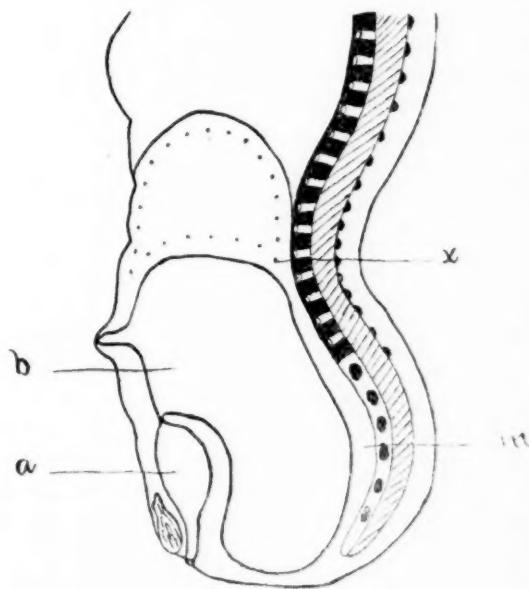
FIG. 3.—A URACHAL CYST WHICH DIPS INTO THE PELVIS.

a. Bladder.

b. Cyst which extends from the floor of the pelvis up to X, the end diaphragm.
The unsettled point is the relation or existence of the peritoneum between *x* and *m*.
X shows the diaphragm on which the intestine rest.

The dotted line is to represent the peritoneum.

any other place, under ordinary conditions, I should call it
peritoneum. The cyst wall would not strip from the tube in all
places alike, but in patches. It had local adhesions.

Again, after carefully examining the ovary, the best I could

make of it was that the cyst wall partially went over it. The main part of the ovary seemed to be covered by its natural peritoneum, while the urachal cyst could be found on part of it. A Graafian follicle had just ruptured, and at the bottom of its cavity was plainly visible the corpus luteum but yet slightly convoluted. Hence, it is my opinion in this case that the urachal cyst wall is *superimposed* on the peritoneum covering the tube and ovary. This conclusion is made with due deference to Mr. Tait's views, as I consider his opinion on this subject the most weighty, as he has really put the whole subject on a recognized surgical basis, and also for the reason that I gained a large part of my knowledge of those urachal cysts which *fill the pelvis* from the opportunities of seeing and assisting in operating on four of his typical cases. Future work will probably be more decisive.

Following will occur a short description of some cases. As the paper is a little long, I condensed them.

The first I will describe is a girl, æt. 17. on whom Mr. Tait operated. I saw the case before the operation with Dr Christopher Martin and we carefully examined it. She began to menstruate at 13, and was fairly regular for awhile, but for the past 18 months she was irregular and felt very poorly. The lower abdomen was hard and brawny. One could only define a limited fluid in the abdomen. The belly over the cyst wall felt hard and elastic. A peculiar but distinct wave of fluctuation could be made out The whole pelvis and lower abdomen was absolutely dull on percussion The wave extended up to 2 inches above the umbilicus, but above that the abdomen was distinctly tympanitic. The wave showed that there was only one cyst, and that was symmetrical. It was a typical case and showed peculiar differences from ovarian or par-ovarian cystoma. Dr. Martin suspected a urachal cyst. Mr. Tait examined her shortly after and said he thought it was a urachal cyst.

In operating on the case, Mr. Tait cut down as usual, but I at once observed that he came on to no peritoneum. Instead of the peritoneum; there appeared a dark red tissue, having an inflammatory outlook. It might easily be mistaken for very much thickened peritoneum, though when once familiar with this kind of cyst, it is immediately recognized. He gradually cut through the cyst wall, which was as thick as sole leather. It was very brittle and gelatinous. Its broken edges

reflected light. It could not be separated from its bed Out of the cyst flowed a peculiar thick pultaceous substance. Flaky, flocculent lymph shreds and jelly-like masses were its main contents. After thoroughly irrigating the cyst, Mr. Tait asked me to examine its interior. So, I introduced my hand and found that all the intestines (except the descending colon) lay above the level of the umbilicus and above the upper wall of the cyst. The cyst itself was a great open cavity. Its walls did not collapse, but lined the abdominal and pelvic walls. Looking into the cyst was like looking into a blown up sac, or into the crown of a felt hat. I felt the uterus fixed and confined against the pubes, and the tubes as large as my thumb, stretching like guy ropes outward to the pelvic wall. The cyst wall was wrapped around the tubes like a meso-salpinx, and covered with tubercles. The muscular wall of the tubes was well intact, for after Mr. Tait had removed them, they continued their rhythmic peristaltic movements some time, which I kept up by exposure to the air and pinching the tubal wall. The cavity of this open, patent cyst extended from just above the umbilicus to the floor of the pelvis. Its rigid, upper wall acted as a diaphragm and prevented the intestines from filling the cavity. Herein lies the danger that this patent cyst will exhaust to death by continued suppuration. If the case recovers, no doubt the viscera will crowd down and collapse the cyst wall, and fill up the empty cyst which occupies the lower abdomen and pelvis.

Now, the view that Mr. Tait favors in this kind of case, relative to the peritoneum, is that it reflects itself from the anterior abdominal wall, just above the umbilicus, or at the upper border of the urachal cyst. It then passes backward behind the cyst, and downward to the crest of the ilium, and is reflected back on the sacrum, and does not enter the pelvis at all. The great open urachal cavity is an arrest of early foetal development, and acts as peritoneum for pelvic viscera— *ovaries*, tubes and uterus. He means that the lower zone of the pleuro-peritoneal cavity met with an accident in growing, and the large allantoitic cyst never contracted into the ordinary urachus. An accidental constriction occurred at the umbilicus and the lower border of the peritoneum and the upper border of the urachal cyst blended into a diaphragm. Another view may be offered that the cyst is the ordinary dilatation of the urachus, and according to the size of the cyst it has dissected off or displaced the pelvic peritoneum. Of course it is well known that the peritoneum is capable of enormous stretching, especially if that stretching be done gradually.

In this case, Mr. Tait, just before closing the abdomen, took two

tablespoonfuls of tr. iodine and added some two ounces of water to it. He then dipped a sponge in the iodine water and pushed it into the cyst and poured in the remainder of the iodine water. He again thoroughly irrigated the cyst with water and closed the abdomen but did not drain. Though the girl was thin, weak and sickly, she rallied well. Some five days after the sac began to suppurate, and he washed it out at intervals with iodine water. He also employed some days after the operation his circular drainage. This was done by passing a rubber drain tube in at the abdominal wound and through Douglas' pouch and vaginal wall, so that material would drain out of both ends of the tube. The girl made a good recovery in some 6 weeks. She gained very much in color and weight, and went home happy.

A second case is that of a little girl, æt. 9. It appears to me exactly like the first case, so that no detailed description will be required. Four weeks before the operation she was supposed to have gastritis. The belly swelled and the temperature kept up to 102°, and the pulse ran high. She became very anæmic. Mr. Tait was called to operate as a last chance. He cut down on the swollen abdomen and found the same peculiar relations as in case one. He said it was a urachal cyst, and cut into it. A thick yellow pus rolled out with the usual flocculent shreds of lymph and the gelatinous masses. He thoroughly irrigated the cyst and closed the abdomen, using a rubber drain tube. At present writing, almost 4 months after, she is quite well. The whole relations and conditions, so far as I could see, were precisely similar to the first case. It was impossible to remove the sac, and it dipped into the pelvis to its floor. It looked like a tubercular process.

A third case was that of a woman, æt. about 40. She had borne children. Her abdomen was large, brawny, elastic and tense. No wave of fluctuation could be demonstrated, and the diagnosis was very obscure. She was quite ill and had been for some time. Mr. Tait cut into the abdomen but could find no peritoneum. The same peculiar thickened tissue appeared, which was quite vascular. It looked like an old inflamed condition. He at once recognized it as a urachal cyst. It was incised and found full of a kind of semi solid mass. It was pultaceous and cheesy. Large amounts of flocculent shreds of lymph were present, with jelly-like substances. The finger introduced swept around in a large cavity, whose walls filled the abdomen from umbilicus to pelvic floor. The pathological process in the cyst was tubercular. The peritoneal cavity was never opened, as it was not in case I and II. The cyst was extra-peritoneal to that cavity which contained intestines. The cyst wall was friable, cheesy. One could break

up the wall between the finger and thumb. The tube on the right was so cheesy and rotten that, in removing, it simply tore away, and a ligature cut through it like it would through a ripe banana. So that no ligature was placed on the removed tube, and what little bleeding occurred Mr. Tait stopped by his unique sponge packing. He requested his assistant, Dr. Martin, to wash the abdomen out daily with iodine water. No circular drainage—simply a glass drain tube. I watched the recovery of this woman with surprise, as it did seem impossible that she would get better under such wide-spread pathology. She had some fever and rapid pulse for a week, but did remarkably well.

A fourth case is that of a girl, æt. 17. She was very spare, anæmic, and looked generally ill. She never menstruated. She began to be ill 6 months before the operation, and has been mainly in bed since. She simply says she feels bad. As is the rule with every one of the cases, but one, which I have seen, she was decidedly tubercular. The diagnosis before operation was urachal cyst. Mr. Tait cut down into the abdomen, and he came on the peculiar relations of the cyst wall to the belly wall. and at once said: "The diagnosis is confirmed; it is a urachal cyst." The cyst was filled with cheesy matter, which was no doubt tubercular. Mr. Tait carefully examined the interior of the cyst and pronounced it a hopeless case. He closed the abdomen and drained with a rubber drain tube. She recovered well from the operation, and I saw her continually for about a month after the operation and she was then wasting away. The tubercular process was simply following its course to its inevitably fatal end. The relations existed here as in other cases where the cyst dips into the pelvis.

A fifth case was one in the hands of a colleague. It was a boy, æt. 12. He had enlargement of the abdomen for months, and it was diagnosed as chronic peritonitis. The characteristic tense, brawny and elastic belly was present. It was clearly a pelvic cyst, encroaching up in the abdomen to a point just above the umbilicus. The wave of fluctuation existed, but not at all marked. A man who had had a few of the urachal cysts would have suspected it. It must not be supposed for a moment that the case was not in talented hands. A most excellent surgeon, with three or four surgeons of experience and ability stood by. The surgeon cut into the abdomen by median incision. He was absolutely puzzled when he came where the peritoneum should be, for he could not find it. He worked about a quarter of an hour on this peculiar appearing tissue, so characteristic of urachal cysts which dip into the pelvis. He finally decided to open the cyst. On cutting through the quarter inch thick walls, pus, cheesy and

pultaceous matter, with flocculent shreds of lymph, came out, but not in such large quantities as such cysts generally contain. The surgeon introduced his finger, and was as much bewildered as he was on finding the cyst. He said the intestines were pushed away up in the belly, and lay on a shelf His view was that the boy had suffered from appendicitis, and that it was a case of "encysted peritonitis" I know that it was a typical case of urachal cyst which dipped into the pelvis, and so suggested this idea, but the surgeon would not entertain it, as he had had no experience in such cysts. Another medical man present who had seen a dilated urachal cyst said it was just like the one he had seen. The cyst reached from above the umbilicus down to the floor of the pelvis and was open, and the finger swept easily through its large cavity. No intestines except the descending colon came below the umbilicus. A very distinct diaphragm existed just above the umbilicus, on which rested the whole intestines. The surgeon closed the abdomen with silk and a glass drain tube. He did not recognize the character of the cyst, even after the few minutes' discussion occurring at the operation.

I did not hear how the boy went on in the subsequent weeks, but understood he gradually recovered.

A sixth case was that of a boy, æt. about 10. The specimen, which was obtained at the autopsy, was exactly the shape of a funnel, with its big end joined at the fundus of the bladder.

It is represented in the diagram No. I.

Conclusions.

1. The ætiology of urachal cysts lies in arrest of development, but in post-natal life they are mainly associated with tuberculosis.

2. We have clinically two kinds of urachal cysts.

3. One kind can be extirpated from the viscera in the abdominal cavity.

4. The other kind dips into the pelvis, and the cyst wall cannot be extirpated from its bed.

5. These cysts may be simply degrees of development or similar pathological processes of the urachus, the size of the cyst being an indication of the extent of the pathology.

6. Mr. Tait claims that the cysts which go down into the pelvis are developed from the allantois, and act as peritoneum

for the pelvic viscera; in fact is peritoneum. No other peritoneum ever entered the pelvis.

7. In those cases where the urachal cyst does not dip into the pelvis, its walls are tough and resemble the urachal wall.

8. In those cases in which the cyst dips into the pelvis, its wall is friable, brittle and gelatinous. It may be as thick as sole leather, and looks quite different from the small abdominal urachal cyst wall.

9. A view may be held which declares that the pelvic peritoneum is simply gradually displaced from the pelvis by the dilating cysts. For those cases which have borne children it may be claimed that sufficient peritoneum has been retained in the pelvis to preserve the functions of the ovaries and tubes.

10. The urachal cyst may lie dormant for indefinite periods, though at any time be excited into activity, resulting in distention.

11. The treatment consists in extirpating the cyst when possible. If in those cases where the cyst dips into the pelvis, and it be impossible to extirpate the cyst from its bed, circular drainage should be employed. The cyst should be washed out at first daily, and later, as required.

12. The mortality in operations for urachal cysts is, so far, about 40%.

13. Dilatation of the urachus is an analogous process to the dilatation of other functionless ducts. Dilatations in Gartner's duct in man and mammals is a good example. It is similar to parovarian cysts which are dilatations of the meso-nephritic tubules, or the tubes of the Wolfian body. Branchial fistula is also a remnant of what evolution has taught man's postnatal life to cast off. The functionless duct known as the vermiform appendix which, from an evolutionary point, is fast fading out of existence, is a splendid sample to tell the tales of our ancestors. Evolution, in accomplishing its process, is ever beset with dangers. For the very structures which it is attempting to stamp out of existence arise to execute destruction. Encysted hydrocele is an example of a dilated functionless duct. Dilatations of the epididymus of the male are analogues of parovarian cysts—both arising from meso-nephritic tubules of the Wolfian body.

I wish to thank D. D. Bishop, of Rush College for his kind assistance in preparing the diagrams.

A CRITICAL STUDY OF THE BICEPS CRURIS MUSCLE AS IT RELATES TO DISEASE IN AND AROUND THE KNEE-JOINT.[1]

By ELIZA M. MOSHER, M.D.,

OF BROOKLYN.

DISEASES in and around the knee-joint are of such common occurrence, and are so serious in their results, that facts throwing light upon their etiology and the conditions which produce them are of interest, not only to the surgeon, but to the medical practitioner, under whose care many of them first come.

The object of this paper is to present the results of an original investigation of the anatomical relations of the *biceps muscle*, and the role it plays in the production and continuance of diseases in and around the knee-joint.

In order to present the subject clearly it will be necessary to review briefly the anatomical relations of the muscles which act with the biceps as flexors and rotators of the leg, also, some of the tissues which enter into the structure of the knee-joint. The flexors of the leg, exclusive of the biceps, are seven in number, viz.: the semitendinosus; semimembranosus, sartorius, gracilis, popliteus, gastrocnemius and plantaris.

The first four may be termed the analogues of the biceps. They take origin at the pelvis and from the aponeuroses of adjacent muscles become tendinous at some point above the internal condyle of the femur and are inserted into the tibia below the line of attachment of the capsular ligament. Of these four muscles the semimembranosus alone is closely connected with the joint. Its tendon spreads out into a broad fasciculus, which is applied to its posterior ligament forming a strong and even support to it; from thence it passes to its in-

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[1] Read before the Brooklyn Surgical Society, and the New York Academy of Medicine (Surgical Section).

sertion upon the inner and anterior surface of the tibia. Owing
to this low attachment and to the laxness of the posterior liga-
ment during flexion the semimembranosus does not make
strong traction upon joint tissue even in forcible flexion of the
extremity.

The three remaining flexors take origin from the posterior
surface of the lower extremity of the femur and are attached
to the tibia. Of these, only the popliteus is in close relation to
the joint. It arises from the posterior ligament as well as from
the external condyle of the femur. Its tendon passes through
an opening in the capsule and coronary ligament behind the ex-
ternal inter-articular cartilage. As it passes through the joint
it is invested by synovial membrane; yet, notwithstanding this
intimate relation, it does not pull upon tissue inside the joint
even in extreme flexion of the leg.

In addition to their office as flexors the semimembranosus
and popliteus rotate the leg inward, the sartorius and gracilis
act as abductors of it.

The capsular or anterior ligament of the knee joint is a
thin but strong fibrous structure which bridges the space
between tibia, femur and patella. It extends laterally as far
as the external and internal condyles of the femur, where it
becomes continuous with the posterior or ligament of Winslow.
It is supported and strengthened by overlying ligaments and
aponeuroses, by which also (through their muscular connec-
tions) it is retracted from between the joint surfaces during
movement of the leg. It is everywhere lined by synovial
membrane, and is inseparably connected with all the tissues
within the joint.

The inter-articular fibro-cartilages differ materially in form
and mobility.

The inner takes the shape of a slender crescent. Its ex-
tremities are firmly attached to the articular surface of the
tibia at its anterior and posterior border, and its convex mar-
gin to the inner surface of the capsular ligament by means of
a narrow band called the coronary ligament. At its widest
part it measures one and one-half cm. The range of movement
of this cartilage is comparatively limited, being held in place
by its close attachment (through the capsule) to the broad, in-

ternal lateral ligament, and to the aponeurosis of the internal vastus muscle. Owing to this attachment it is more easily ruptured than displaced.

The form of the external articular cartilage is that of a circle not quite complete; its extremities are fastened in front of and behind the spine upon the articular surface of the tibia; this places them at the very center of the knee-joint in close relation with the crucial ligaments, to the posterior of which the cartilage is also attached. At its widest part it measures one centimeter. Like its fellow it is united to the capsule by means of the coronary ligament, which also attaches it posteriorly to the ligament of Winslow. Its entire circumference is traversed by this ligamentous band, with the exception of a section one centimeter in extent at its outer part, where a button-hole-like opening exists for the passage of the tendon of the popliteus muscle. (I have not found the cartilage grooved at this point for the passage of this tendon as is stated by some authors). To the poster'or angle of this slit fasciulus from the biceps (to be described later) is attached. Owing to its extensive capsular attachment, its own pliability and especially to the shape and movement of the articular surfaces to which it is applied, the range of movement of the external cartilage is extensive. The amount of surface covered by synovial membrane also is large, as compared with that of its fellow upon the inner side.

The synovial membrane which lines every portion of the joint is especially subject to friction in three regions, viz.:

1. On the line of attachment of the capsular ligament to the tibia, anteriorly (owing to traction of the coronary ligaments in sudden and forced flexion of the leg, and to blows from without).

2. At the point of insertion of the crucial ligaments and cornua of the external articular cartilage.

3. Behind the long external lateral ligament near the head of the fibula.

Inflammation of the synovial membrane is most persistent in these regions, owing, doubtless, to the fact that the greatest amount of friction during movement occurs here.

Up to this point I have been unable to find any muscle which by virtue of its anatomical relation makes special traction upon the capsular ligament, inter-articular cartilage or synovial membrane of the knee-joint.

In beginning a critical study of the biceps we are at once confronted by the fact that this one muscle on the outer side of the thigh performs alone the work shared by several muscles on the inner side, which indicates a complex arrangement of muscular fibre, and a functional activity in excess of its fellows. It takes origin at the pelvis in close connection with the semi-tendinosus; its fibres pass downward and outward. Some of them become tendinous in the upper third of the thigh, forming the beginning of the ribbon-like fibrous band which traverses the remainder of the muscle, becoming below its tendon of attachment to the fibula. All of the pelvic fibres join this tendon at some point above the outer condyle of the femur. The name "long head" is commonly applied to this upper portion of the muscle.

The short or femoral head arises from the linea aspera, external supra-condyloid ridge and external inter-muscular septum. Its line of origin extends from the middle of the femur (sometimes higher) to a point four or five centimeters above the outer condyle. The fibres which take origin from the linea aspera pass downward and outward and *end* in the aponeurotic band described in connection with the "long head." They increase the leverage power of the muscle materially. The fibres from the supra-condyloid ridge and inter-muscular septum pass in the same direction but do not *end* in the aponeurotic band; they join it, pass down along its anterior border and spread out on its femoral surface. Three or four centimeters above the head of the fibula a group of them separate, become fibrous and are applied to the capsular ligament at its junction with the ligament of Winslow. These act the part of a tractor of the capsule and inter-articular cartilage. The remaining fibres from the supra-condyloid ridge become tendinous opposite the head of the fibula, divide in two slips, a superficial and deep, between which the long external lateral ligament passes to its insertion into the head of the fibula. The superficial slip is closely connected with

the fibular tendon of the biceps, it crosses the tibia to a small, but strong insertion near the outer border of the ligamentum patellæ.
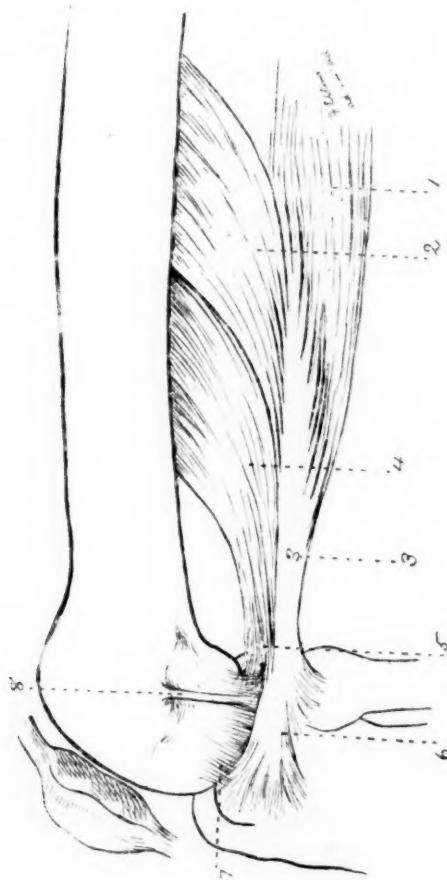
FIG. I.—BICEPS CRURIS MUSCLE WITH ITS ATTACHMENTS.

1. Long head.
2. Portion of "short head" from linea aspira.
3. Fibular tendon.
4. Portion of short head from supra-condyloid ridge and intermuscular septum.
5. Tractor of capsule and articular cartilage.
6. Tibial tendon of biceps.
7. Capsular ligament.
8. Long external lateral ligament.

The deep portion of the tibial tendon, much larger than the superficial, crosses the tibia beneath the lateral ligament. In passing to its insertion, it not only plays over the surface of the capsule above the head of the fibula, but blends with it along its line of attachment to the tibia, and some fibres pass upward upon it as far as the insertion of the coronary ligament. (Fig. II). This intimate relation between the biceps muscle, the capsular

ligament and through it with the interarticular cartilage and synovial membrane has not, so far as I know, been heretofore described.
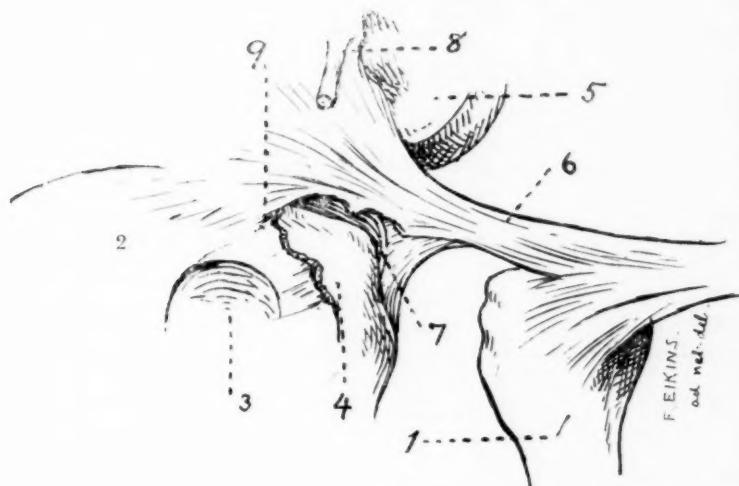
FIG. II.—TIBIAL TENDON OF BICEPS, SHOWING ITS RELATION TO THE CAPSULAR LIGAMENT AND EXTERNAL ARTICULAR CARTILAGE.

1. Fibula disarticulated and drawn backward.
2. Tibia.
3. Articular surface for fibula.
4. Portion of intra-capsular surface of tibia over which the tibial tendon plays.
5. External condyle of femur.
6. Tibial tendon of biceps.
7. External inter-articular fibro-cartilage.
8. Long external lateral ligament.
9. Cut edge of capsular ligament.

To recapitulate, we have in the biceps cruris a muscle which crosses three joints. It arises by two heads and has three tendons of insertion. The fibres comprising the long head, and those of the short head which arise from the linea aspera, make up a muscle, the tendon of which is inserted into the head of the fibula. The remaining fibres of the short head are inserted into the capsule behind the tendon of the popliteus, and into the tibia anteriorly, blending with the capsular ligament, more or less, by the way.
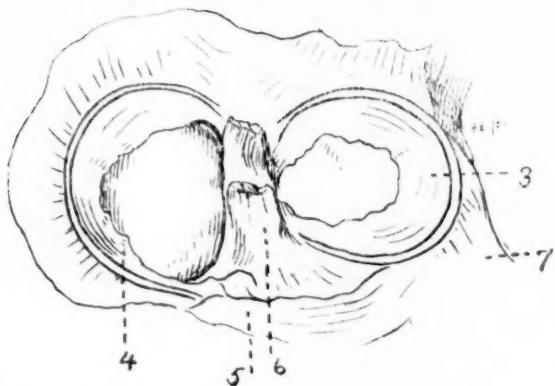
FIG. III.—INTERIOR OF KNEE-JOINT.
Quadriceps extensor and patella reflected.
Inter-articular fibro-cartilages in position of extension of leg.
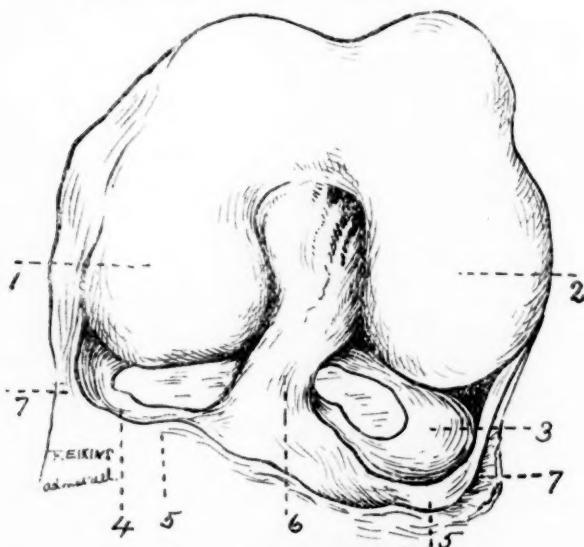
FIG. IV.—INTERIOR OF KNEE-JOINT.

Inter-articular fibro cartilages in position of flexion of leg.

1. Internal condyle of femur.
2. External condyle of femur.
3. External inter-articular cartilage retracted as in ordinary flexion of the leg.
4. Internal inter-articular cartilage in flexion of leg.
5. Coronary ligaments.
6. Crucial ligaments.
7. Capsular ligamet.

In the accompanying figures (Figs. III, IV and V) are shown the effects of traction upon this capsular slip of the fibres of insertion of this muscle. In Fig. III, the nearly circular form of the external fibro-cartilage and its narrow insertion are shown, and it is easy to understand the greater degree of mobility enjoyed by it in consequence of this anatomical relation. Fig. IV shows the relation of the fibro-cartilage in ordinary flexion of the knee; in Fig. V is seen the change in the position of the external fibro-cartilage, where in addition to flexion a sharp pull at the biceps muscle has been made.
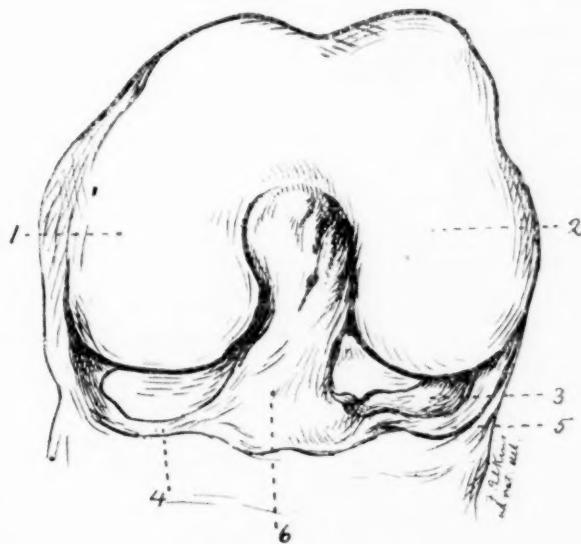
FIG. V.—INTERIOR OF KNEE-JOINT.
External inter-articular cartilage drawn backward and outward by forcible traction of tractor tendon of biceps muscle during flexion of leg.
1. Internal condyle of femur.
2. External condyle of femur.
3. External articular cartilage displaced by action of biceps.
4. Internal articular cartilage.
5. External coronary ligament.
6. Crucial ligaments.

The biceps muscle acts as a flexor of the leg, an external rotator and a retractor of the capsular ligament and interartic-

ular cartilage. With such a leverage upon the tissues in and around the knee-joint, it is not difficult to believe that sudden and forced action of the biceps muscle as in a stumble up stairs, over the curb stones or downward, might produce serious injury within the joint, to the capsular ligament or to the periosteum at its own point of attachment to the tibia.

Disease of the joint or periosteum once established, how can it be otherwise than that the action of the biceps should tend to perpetuate it?

The nutrition of the knee becomes impaired by disease more promptly perhaps than that of any other joint, and when impaired is regained more slowly.

All who are familiar with knee joint affections know that long continued disease means long delayed recovery. Any measure, therefore, which makes it possible to exercise the joint, either actively or passively, without injury, means a shortening of the time during which its unfortunate possessor must remain physically inactive.

In view of the fact that serious injuries to the knee occur most often during the movement of flexion of the leg, also that the internal flexor muscles, by virtue of their low insertion, etc., make no special traction on the joint, it is reasonable to conclude that the action of the biceps-cruris is, in *some* cases, the exciting cause of inflammation in and around the knee, and in a large number of joint diseases its movement is a grave source of irritation.

The practical question now arises, can a tenotomy or myotomy be performed to relieve this tension, without disturbing the integrity of the joint?

Section of the outer ham string would of course accomplish the desired result, so far as lessening tension is concerned; but the possibility of producing continued lameness by such an operation would deter the surgeon from making it, except in very grave cases. A tenotomy of the superficial and deep slips of the tibial tendon, in front of the external lateral ligament, is a more simple operation, and was effective in the case which will be reported in connection with this paper.

But an incision down to the bone so near the border of attachment of the capsular ligament, and the tibio fibular articulation, is not entirely free from danger, especially as there is in this region, in some knees, a passage of communication between the two joints.

In my study of the biceps, I discovered that the muscular fibers taking origin from the external supra condyloid ridge of the femur and the intermuscular septum are the only ones which make traction upon the capsular ligament. These fibers accompany the fibular tendon as far as its insertion, becoming tendinous at this point. To exsect them in some part of their course would seem to be a comparatively simple procedure, and one which would not be likely to involve injury to contiguous tissue. I would, therefore, suggest the following operation, hoping it may prove so safe that it can be resorted to, not only in long-continued and serious cases of knee joint diseases, but in the early stage of cases which, if allowed to go on, may become chronic.

Make an incision, beginning four centimeters above the upper part of the head of the fibula, extend it upward between the biceps and ilio-tibial band of the fascia lata. Dissect down to the biceps, isolate it and remove *all* the muscular fibers found in connection with it at this point. (It should be remembered that these fibers line its femoral surface, as well as run along its anterior margin.)

Remove also a small V-shaped piece from the anterior border of the tendon; close the wound with ordinary antiseptic precaution.

Begin movement of the leg as soon as possible after healing is accomplished.

By this proceedure the friction produced upon tissues in and around the joint, by traction of the biceps, will be removed; possibly, also, the cutting off of so large a section of the muscle will diminish rotary movement within the articulation, and thus, in some degree, give additional rest to inflamed tissues.

ILLUSTRATIVE CASE.—Miss A. B., æt. 44. Physical history good;

has led a very active life until eleven years ago, when she took a position which necessitated a sedentary one.

In January, 1882, she sat in a public meeting where the seats had been closely crowded together. Owing to their construction no change of posture could be made to relieve the strain produced by extreme flexion of the lower extremities. Two hours and a half in this cramped position produced discomfort almost amounting to pain She passed a restless night afterward, and the next day both knees were so stiff and lame that walking was difficult. The second day she took a journey on the cars, and visited a large institution, climbing many flights of stairs, etc. During the return journey she first noticed twinges of pain in the left knee, which were somewhat relieved by extension of the leg. On the third day the pain became more constant, and slight swelling was observed below the patella. She walked little during the next few days, and tincture of iodine was applied. The pain continued and a deep soreness was complained of. At the end of a week movement became so difficult that she gave up the effort to walk, and did not again bear her weight upon the limb for nearly a year.

Hot fomentations, blisters, both superficial and deep, the actual cautery, electricity, all were used, at one time or another, with no apparent good results. At the end of six weeks a plaster splint was applied from hip to toes, which greatly relieved the pain. A couple of months in bed resulted in improvement, and in the summer she was taken to the seashore.

Ten months after the onset of the disease she began to walk without the splint, with cane and crutch.

She was now unwisely permitted to resume the duties of her position, and soon over exerted both herself and the knee which produced a return of the trouble.

The surgeons who had seen the case up to this time had pronounced it a mild case of synovitis, although it lacked many of the distinguishing features of synovial inflammation. There had never been any indication of fluid in the joint, and a direct blow on the sole of the foot caused no pain in the knee. On the other hand, flexion of the leg always produced pain, and movement was followed by an increase of soreness, which the patient located upon the front of the head of the tibia.

There was at no time demonstrable increase in size, except along the line of the tibial attachment of the capsular ligament, in which region there was some swelling from the beginning, increasing the size about an inch. There was, however, a marked lack of symmetry over the entire knee.

The patient was seen at this time by one of the most eminent sur-
geons in this country. who, after careful examination, said that there
was no synovitis, but a general inflammation of fibrous tissue on the
front of the knee, involving especially the patellar ligament   As he
enjoined absolute and long-continued rest in bed, she was removed to
a private room in a large hospital.   Here she came under the care of
another surgeon of wide experience. who pronounced the condition a
bursitis, affecting especially the bursa beneath the ligamentum pa-
tellæ.

Poultices, compression and deep blistering were tried in succession.
No improvement being manifest, he advised extirpation of the sub-
patellar bursa, saying "without the operation the knee would never get
well."   The patient objected, and aspiration was made to confirm the
diagnosis.   No fluid was withdrawn

The next surgeon under whose care she came believed the affection
to be a sub-acute periostitis.   He put the extremity in an excision
splint, to give it complete rest, and had an ice bag applied across the
front of the joint continuously for several weeks.   Under this treat
ment a decided gain was perceptible. and for the time being pain was
entirely subdued.

Three months from the time she entered the hospital a long silicate
of potash splint was applied, and, with a high soled boot on the other
foot, she was permitted to move around on crutches, and shortly to
leave the hospital

The splint was kept on six months, at the end of which time the
circulation in the leg had become greatly impaired; venous congestion
was intense when in the upright position.

Having changed her residence she now consulted a noted professor
of surgery, who pronounced the condition a synovitis. involving espe-
cially the fibrous tissue outside the joint.   He advised her to remove
the splint and to slowly bring the extremity into use.   After faithful
effort on her part and many discouraging set-backs, the patient, at the
end of eight months more, was able to walk two or three blocks un-
aided.   Movement, however, was always followed by aching in the
knee, and sudden flexion of the leg, with the superimposed weight of
the body upon it, was almost certain to produce a return of pain and
soreness, which only continued rest would relieve.

At this stage began a chapter of accidents which continued during
the next five years.   A mis-step on the stairs, a trip of the foot upon
a rug, a kick of the toe against an obstruction, rendered the limb use-
less from six weeks to six months, repeatedly, so that at the end of

seven years from the time of the accident, a year and a half was the longest she had been off crutches at once. She had not been able to use the limb to step up and down stairs in the ordinary way, the attempt to do so always producing such soreness as threatened to lay her aside.

The knee reached its best condition in the summer of 1887, when a fall down stairs was followed by a new attack of inflammation.

Dr. J. D. Rushmore, of Brooklyn, now saw the case in consultation. He believed the condition to be a periostitis, located upon the anterior surface of the tibia, and perpetuated by traction of tissue in movement of the extremity. He considered the possibility of relieving this tension by an incision, but decided that this was not feasible. He recommended rest in the recumbent posture for a few weeks, after which a Judson brace was applied, and movement on crutches allowed. At the end of nine months (five of which were passed in the South under good hygienic conditions), the patient regained use of the extremity, but the knee was weak, and movement fatigued it greatly.

After six months of limited activity another accident occurred which necessitated a return to crutches.

About this time I made a somewhat careful dissection of a knee, with special reference to the symptoms presented in this case, and discovered a fact which up to this time, had been overlooked, viz., that the surface where tenderness to pressure had all the time been most marked corresponded to that *covered by the attachment of the tibial tendon of the biceps muscle.* A further study of the relation of this tendon to the periosteum and capsular ligament led me to conclude that the action of the biceps muscle was not only the source of irritation, which had perpetuated the disease, but the original cause of trouble.

Long-continued forced flexion of the leg was the first fact recorded in the history of the case. Repeated injuries due to sudden flexion followed. Inability to recover the use of the extremity in stepping up and down stairs—these and many minor facts led to this conclusion. Dr. Rushmore thought this might be a solution of the problem which had puzzled so many wise heads, and recommended division of the tibial tendon of the muscle.

Several other surgeons saw the case at this time, and all concurred in the opinion that such an operation would do no harm, if it were not productive of good.

The statement was made by two that the knee would probably never be of much use, unless relieved by surgical interference. Accordingly,

on December 22, 1888, Dr. Rushmore performed the operation, Prof. C. L. Ford, Prof. Jarvis Wight and others being present.

An incision was made, beginning in front of the fibular attachment of the external lateral ligament, extending obliquely downward and forward six cm. The tissues were carefully separated down to the tibial tendon of the biceps, which was then incised as far behind its point of insertion as possible. The wound was closed without special antiseptic precautions. It healed within ten days, and the patient resumed the use of crutches. The only change observed subjectively was a sense of freedom in movement of the leg not felt before. From this time the deep soreness, so long complained of, began to abate, and motion was not always followed by pain. She was able to discard crutches in a few weeks, and the knee went on to recovery without a set-back. The usual number of mis-steps, etc., have since been made, and on several occasions she has fallen headlong over obstructions. These accidents were followed by stiffness and more or less pain, which, however, passed over in a few days. At no time has she been obliged to discontinue the use of the extremity. At the present time, two and one-half years after the operation, she leads a very active life, she does not limp, is able to walk half a mile without discomfort, can step up and down stairs, and stand an hour or more without over fatigue to the knee.

The muscles above the knee have all regained their normal size, *except the lower half of the short head of the biceds*, which has undergone marked atrophy, a distinct depression outlining its location. External rotation is slightly impaired, and the external ham string tendon is a little less tense than the internal in flexion of the leg. Up to the present time this is the only case recorded in which section of the tibial tendon of the biceps has been performed. In this case if the operation had been done within the first year the patient would, doubtless, have been spared years of suffering.

A CASE OF SYMMETRICAL CONGENITAL DISLOCATION OF THE HEAD OF EACH RADIUS.

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DURING the writer's attendance at the Buffalo Orphan Asylum, his attention was called to the following case by a remark of the matron's that there was a colored boy in the Home who had queer hands and who "ate backwards".

An investigation elicited the following facts and statements: Willie Lewis, æt. 8, colored. His mother is dissipated and cannot be relied upon for any facts concerning the boy's previous history. Fortunately the colored midwife who assisted at the child's birth was found and from her it was ascertained that the fixed position of the hands (in pronation) was at that time noticed, and that it was also remarked that the child then seemed otherwise misshapened, though nothing more definite could be learned in regard to this latter condition. The boy, it is said, became more normal in shape in a few days, but, as his mother puts it, his arms have remained crippled ever since.

So far as can be learned there is no history of post-natal accident, nor of any similar condition in any other member of the family.

Physically the child is normal except that the hands are always pronated. If asked to accept a penny he does so with the finger tips, not with the palm up. If one insists on dropping it into his hand, he flexes the forearm completely on the

arm and carries the hand over the shoulder, its dorsum down-
ward, showing very plainly the lack of rotation. Flexion and
extension of the forearm are complete and perfect. Rotation
of the forearm is entirely wanting, and what little advance
that is made from pronation to supination is purely through the
radio-carpal joint.

FIG. 1.—Boy trying to grasp a stick so as to place the hands in complete supination.

Examination of the elbows shows the external and internal
condyles and the olecranon normally situated; immediately
beneath the articular surface of the external condyle is a
roundish mass which can be traced into the radius, and which

on forcibly attempting to rotate the forearm moves slightly
with it. The radial head is absent from its normal position.
By following the radius backward it can easily be noticed that
there is a backward dislocation of its head and that the radial
neck and shaft have curved themselves partly around and over
the ulna, allowing the lower end of the radius to lie internal to
the ulna as it normally is in full pronation. Supination is pre-
vented by this locking of the radius about the ulna. The dis-
located radial head on complete flexion of the forearm pro-
jects very much like a second olecranon. There is no coales-
ence of the radius and ulna.

Fig. 2.—Exhibits the right elbow with differently shaped papers over three points of
interest: (1) a triangle on the external condyle; (2) a circle over the normal
position of the radial head, and (3) a square over the dislocated
radial head.

The condition is symetrical, i.e. exists at each elbow.

This boy was shown to the class at the Buffalo General Hospital Clinic and was examined by Prof. Roswell Park, who agreed with the writer in the above diagnosis.

A search through the literature at hand discloses but three similar cases recorded and shows its great rarity. The first is by Dupuytren (quoted by Hamilton in "Fractures and Dislocations") and is described as follows: "The abnormal position which the head of the radius had assumed was at the back of the humerus, beyond which it extended for the space of at least an inch. This disposition of parts was absolutely identical on the two sides, and had all the characteristics of a congenital affection."

The second is one mentioned by Servier (quoted by Herskovits, *Wien. Med. Press.*, 1888, p. 217), and a third case by Herskovits personally (*ibid*).

This last case was a soldier, æt. 21, with no family history of any similar trouble. The lessened mobility at the elbow-joint first attracted attention. Examination of the joints showed them to be very markedly deformed, with the radial heads enlarged. Pronation was complete, supination only one-half.

Malgaigne, according to Herskovits, refers to five cases, but gives no particulars.

Herskovits also speaks of experimental work concerning the production of elbow dislocations. Streubel, Barros, Lübker, Königschmid, as well as Herskovits have contributed to this work, which is, however, unsatisfactory because more or less contradictory.

Herskovits deduces as hypotheses to explain these luxations: (1) External injuries to the belly of the mother (Cruveillhier) or muscular activity of the fœtus (Chaussier). (2) Disease of the capsule or the ligaments (Sedillot), hydrops or fungus (Parise, V. Ammon). (3) Disease in the central nervous system, with consecutive contractures (Guerin) or muscular paralysis (Verneuil). (4) Peculiar fixation of the limbs *in utero* (Dupuytren). (5) Defective construction of the joint (Paletta, Breschet, V. Ammon).

THE MÜTTER LECTURES ON SELECTED TOPICS IN SURGICAL PATHOLOGY.

SERIES OF 1890-1.[1]

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LECTURE VIII. (CONTINUED).

CONCERNING MIXED AND SECONDARY INFECTIONS.

SYLLABUS.—*Introduction to the study of mixed and secondary infection:* Definition of the terms. Their evidences met with everywhere about the body. The most interesting effects, for the surgeon, are met with in the bones and joints. *Dysentery. Cholera. Hydatid cysts.*

MIXED INFECTION is a term applied to those collec-tions of pathogenic organisms in which we find more than one variety of microbe. Thus in a recent tubercular ab-scess we may find both tubercle bacilli and pyogenic cocci; in a post-typhoid abscess both the latter and the distinctive bacillus of typhoid, or in a post scarlatinal suppuration beside the true pyogenic agents there may be found one or more bacterial forms supposed to be in some way related to the fever. In the pus of a gonorrhœal bubo, for instance, I have found beside the ordinary pus organisms the specific coccus of Neisser. Mixed infection is usually easy enough to demon-strate; it is much more difficult to make out the order of at-

tack, though *a priori* we can usually indicate it. Post-febrile collections of pus constitute our most common and most illustrative instances. For example I have myself recognized pyogenic cocci (mostly streptococci) in post-scarlatinal intra-articular abscess, along with one or two other forms whose exact determination I could not make out. A case much like this was reported in 1884 by Heubner and Bahrdt in which retro-pharyngeal abscess and purulent synovitis were met with. There appears to be but one explanation of these cases: As the result of the impregnation of the blood and lymph by poisons resulting from the febrile disease the resistance of the tissues is diminished, and cells now succumb to bacterial invasion which before would have successfully withstood it. If one will consider the large area exposed to contact with the source of poison in cases of, say, gastro-intestinal catarrh, typhoid fever, or in the infected uterus *post-partum*, he will see how favorable is every condition for permitting such a toxæmia to take place by absorption. The peculiar effects thus due to toxæmia are discussed in another place.

The occurrence of joint inflammations of various degrees of severity in the course of or following the various infectious diseases, has long been recognized, although their exact relationships have only been made out within the present century. Whether such inflammations were mere accidents or coincidences, or whether they bore the relationship of cause and effect, has only been cleared up since the science of bacteriology has shed light upon this very abstruse topic. For instance, the synovial effusions accompanying acute inflammatory rheumatism are among its most prominent clinical features. If now in unusual cases this effusion shall take on the purulent character so that we have to deal with an acute abscess in the cavity of the joint, it is a matter of no small importance to determine whether rheumatism by itself can ever produce abscess, or whether an entirely different and more or less independent condition has been produced. Until bacteriologists had completely established the fact that there is no suppuration without bacteria, this point could not be cleared up. As the matter stands to-day, the parasitic nature of acute rheumatism not being established, we are compelled

to conclude that upon the primary condition of serous exudate there has been grafted a second and more serious condition of microbial infection of material which has already left the blood vessels.　This is a fair sample of what should be spoken of as primary infection.　The term *Secondary Infection* is intended to convey a somewhat different meaning.　Under this name are comprised those conditions where, upon that caused primarily by bacteria of one species, there is engrafted another infection due to microbes of a different species.　To illustrate this statement a little, take a gumma of tubercular or syphilitic origin in which there are no evidences of suppuration. This may exist for weeks or months in form almost unaltered. From some cause or other, be it easy or difficult of explanation, an infection of this specific granulation tissue by pyogenic bacteria takes place, and then we have the rapid formation of an abscess.　Again in the lungs more or less infiltrated with tubercular tissue, the same kind of pyogenic infection takes place, and cavities or excavations are rapidly formed.　(This without reference to the fact that tubercle bacilli may of themselves develop pyogenic powers).　Yet another illustration: In the well-known form of gonorrhœal arthritis met with most often in the knee, numerous investigators have found gonococci in the effused fluid.　It has already been shown (see Lectures III and X) that gonococci by themselves are not pyogenic.　So long as no secondary infection by the ordinary pyogenic bacteria occurs, this fluid remains serous or sero-fibrinous; but if such secondary infection do occur, there is rapid formation of a genuine pyarthrosis.　These illustrations serve better to define what is meant by mixed infection than would statements alone without illustration.　By quite similar process we have the conversion of a tubercular pleurisy or pleuro-pneumonia with effusion into an empyæma; of an originally tubercular meningitis into the suppurative form, and of many other well known conditions.

De Wildt (Diss. Utrecht, October, 1889) demonstrated that the exudate from a case of serous inflammation makes an excellent culture material for pyogenic organisms by tying a broad band tightly around the base of a rabbit's ear, and then applying very hot water for a few moments to the ligated part.

The consequent serous exudate was, by the injection of small quantities of staphylococci, so affected that very quickly a profuse suppuration occurred. Control experiments without the previous irritation of the ear, gave no result. This is of interest as showing how the exudates in rheumatism are easily infected. It is furthermore known that fungous joint inflammation, in other words tubercular infection, occurs occasionally after acute rheumatic affection of the joints. This fungus condition is of course nothing but a primary tubercular infection occurring in the same way as suppuration. Upon this fungous condition may occur a second infection of pyogenic cocci, so that we have three entirely different lesions of the same joint. First, acute rheumatic synovitis; second, tubercular infection of the joint; and third, and much later, suppuration and degeneration. Not a few of these secondarily infected cases occur as results of extension of infection and embolic pyæmia. It is not difficult to account for the secondary infection in such cases. It can occur, for instance, through diphtheritic infection of the pharynx, or follicular abscess in the tonsils; perhaps more commonly from the pharynx than from any other locality. Indeed so common is such infection from unsuspected or concealed sources that Greisinger described what he called a suppurative diathesis, which had in itself much of what we speak of as hospitalism. That the system is left in a more than ordinarily vulnerable condition, with lowered susceptibility or power of vital resistance, after various acute infectious diseases, is well known. The ease with which many such individuals succumb to tuberculous processes, or the manifestation of acute so-called scrofulous lesions is only too frequent. Perhaps more than any other disease, measles leads to this condition, and Luecke, among others, has called special attention to the frequency of joint and bone diseases following soon after this disease.

I think it proper to make a distinction between *secondary* and *mixed* infection, limiting the former term to those cases where a fairly distinct sequence of events can be observed, and applying the latter term to those where complex or multiple infections occur at or about the same time. This latter I consider to be the case in many instances, as in the contraction,

often, of diphtheria, gonorrhœa, puerperal fever, dissecting wounds, etc. And in other lectures in this series I have called attention to the added morbific effect of introducing two widely variant species at the same time. There is much to show, therefore, that a mixed infection is oftentimes worse than a simple form.

It is worth while to remember, in this connection, the peculiarity of the *kefir* ferment. This is complex, and is composed of three different organisms, each of which can be cultivated alone; but the peculiar fermentative· action essential to the production of *kefir* is only brought about by the combined activity of all three forms.

From what has been already said, it will be more readily apprehended how some previously inexplicable conditions have been brought about. For instance, the formation of a hydrops articuli, and then the subsequent spontaneous dislocation of the joint; and an important therapeutic rule may be from such cases deduced, viz., that when a joint is so involved it needs to be handled with extreme caution, and carefully watched for a long time. Massage, which is ordinarily of so much efficiency in the dispersion of joint effusions, would be in such a case most undesirable, since by dispersion of the fluid might be precipitated a metastatic infection of various other parts of the body. So, too, with aspiration or incision for removal of the fluid. No matter how carefully performed, it would be theoretically impossible to avoid infection of tissues between skin and synovial membrane, and the path for a general infection might thus be made. If, indeed, such operative measures must be resorted to it would be desirable to follow them with intra-articular injection of emulsions containing iodoform. By such a measure not only is protection instituted, but an antidote to local infection is at the same time introduced.

The various inflammations of bone following acute infectious disease are not so often met with nor so well known as those of the joints. Nevertheless they occasionally occur, and when acute, are usually of such extreme severity that the crisis occurs within a few days at most.

Maisonneuve and Chassaignac were among the first to point

out that there is a form of periostitis following typhoid, scar-
latina, small-pox, etc., of frequently increasing severity, and it
is mainly to the French writers that we owe our knowledge of
this condition. Later Luecke showed how not merely perios-
titis but even more acute forms of osteomyelitis resulted from
the infectious diseases. This was in 1880, while a year or two
before this Langenbeck had warned the Congress of German
Surgeons that surgeons generally had hitherto laid altogether
too little weight upon the relationships between inflammations
of bone and other acute diseases, and had paid a dispropor-
tionate amount of attention to traumatic and rheumatic causes.
These observations of Langenbeck's were discussed by Pon-
fick in a lecture upon necrosis of bone marrow following re-
lapsing fever. The same surgeon published in 1872 and 1873,
in Virchow *Archives,* further contributions to the behavior of
bone marrow in cases of typhoid fever. A little later Freund
continued the studies of his teacher Ponfick, and shed much
more light upon the subject. Among others Ebermaier, ex-
amining the ribs of a patient dying during the fourth week of
typhoid fever, found typhoid bacilli in their marrow, and
showed, as did Freund also, how favorably conditioned the
marrow is for the development of such organisms. Fischer
showed that in all the infectious diseases the periosteum of the
entire skeleton becomes more vascular and succulent, and is
detached with much greater ease than in the normal condition.
In other words, the lower layer of cells of the periosteum, as
well as that cellular layer which surrounds the vessels en-
tering the bone, is attacked in the same way as the soft parts
at a greater distance from the bone, and this condition is
summed up in the expression that inflammation of the bone is
virtually inflammation of the soft parts around it. It is not
unfair to view the involvement of the bone marrow and the
tissues outside of it in the same way as we view the alterations
in the spleen; they are of nearly the same general character.

Neve, in an article elsewhere alluded to, speaking of a fact
that organs of such size and function as bones and joints fre-
quently suffer after septic fevers, alludes to the intimate nerv-
ous and vascular relationship of the joints with their over-lying
skin, the similarity of epithelium, the rôle of the medulla in the

formation of the blood and the vascularity of the sheathing of the bone; and in the case of the teeth and alveolar process their dermal origin and exceedingly active and developmental changes, by which participation in the morbid process set up by septic poisons is favored.

Authors have described a peculiar form of necrosis of the alveolar process, with more or less destruction of the jaw bone, peculiar to the eruptive fevers and much resembling that from fumes of phosphorus. In this case it would seem as if the essential nature of the lesion was a poisoning, in one case (phosphorus) from without, *i. e.*, from an extraneous source, in the other from within. Mr. Salter has called attention to a peculiar coincidence in this matter, since, in the jaw necrosis of eruptive fevers, the poison is generated in the organism and affects the teeth and teeth pulps by reason of their being dermal organs; in other words members of the tegumentary system, upon which system generally the poisons spend their chief destructive force. These cases occur commonly in children, and usually in those of low state of vitality, evident both in their general systems and their teeth. Salter has also called attention to the extremely slight changes in nutrition which occur in teeth when once they are formed, by which consequently they are removed to a large extent from possibility of repair from acute disturbances.

From the time of birth to the eighth or ninth year the jaw bones are the seat of intense development in the formation of teeth, and are among the most vascular parts of the body. About the middle of the period named, that is about the fifth year of age, the jaws contain no less than forty-eight developing teeth and tooth-germs. It is at about this time that the poisoning of the exanthematous fevers appears to exert its most marked effects upon the dental system. Salter appears to have been among the first to recognize necrosis of the alveolar edge and shedding of the teeth as one of the sequelæ of these fevers. This particular gangrenous tendency seems to be almost peculiar to the eruptive fevers, including typhoid under this heading, though even here it is very rare. In order of frequency it is most commonly met with after scarlet fever; measles and small-pox coming along second and third. Whether

the gangrenous process alluded to in the above remarks is of the nature of a specific one, in other words whether it is the result of a mixed or secondary infection, or whether it be due to circulatory disturbances, is not known; nor do I know of any bacteriological researches concerning the matter.

When in the course of a purulent infection one sees the development of a suppurative arthritis, it is logical and necessary to admit the relation of cause and effect between the febrile condition and the manifestation in the joint. With this statement Lapersonne begins his monograph on *Non-Tubercular Infectious Arthritis*, a work, in the writer's estimation, of very great value. Nearly a century ago Bonnet gave up a chapter in his great work on Diseases of the Joints, to what he called consecutive rheumatisms, which he carefully warned us were not to be confounded with genuine rheumatisms. Since his time we have studied with great care blennorrhagic purulent arthritis of septic or puerperal origin, and the various arthritides which follow infectious fevers, and have arrived now at a very different period, when these matters have to be studied mainly in their bacteriological aspects. Lannelongue has made out five varieties of arthritis as follows:

1. Traumatic arthritis.

2. Inflammatory arthritis, caused by extension from surrounding inflammations.

3. Generalized arthritis due to rheumatism or gout.

4. Arthritis due to nervous or cord disease, such as progressive muscular ataxy.

5. Septic arthritis, parasitic or virulent, virtually of microbic origin, and secondary to some general disease.

This last may be regarded virtually as infectious arthritis, and is the only form which concerns us here. A few years ago Bouchard made the following statement: "Parasitism is established with certainty for four diseases of men, anthrax, glanders, tuberculosis, and malignant œdema, while it is almost established for gonorrhœa and erysipelas." It is simply an evidence of what rapid progresss we are making that within so few years, namely, about six or seven, this list has to be so greatly extended. It is necessary now only to show that a given disease is of parasitic origin, in other words infectious, to con-

vince one that various complications may be met with during
its course or after convalescence; and it is quite likely that the
near future will add several names to the list as it stands to-day.
For the surgeon the joint complications of these various dis-
eases have a peculiar and wide importance, not merely because
of the serious nature of many of these manifestations, nor be-
cause of their relative frequency, although abscess in the joint
will be met with probably fifty times to one abscess in the
liver or any of the viscera.

Another reason why these lesions stand out so prominently
in our interest at present, is because since the *renaissance* of
surgery which bacteriological study has brought about, we
have at last the explanation of that for which, in time past,
many, and sometimes absurd theories were invoked. I do not
mean that everything is yet clear, but I am certainly of the
opinion that matters have been greatly cleared up for us since
Koch and Pasteur began their work.

One of the greatest difficulties in the study of these lesions
is that of accurate classification. Is one to speak of them ac-
cording to the number of joints involved, according to the
disease in the course of which the lesion appears, or accord-
ing to the organism which appears to be particularly at fault?
In other words, shall one speak of a mon-articular or bin-artic-
ular, or of a post-typhoidal, or of a bacillar abscess, or how?
It seems to me that the best nomenclature is that which I
have tried to use throughout this essay, and to speak, for in-
stance, of a mon-articular post-gonorrhœal synovitis, or a post-
puerperal poly-articular purulent arthritis; endeavoring to con-
vey in the fewest possible words the largest amount of infor-
mation.

As a matter of fact not until the fluid or pus from these
cases has been examined can we say whether common patho-
genic forms or specific disease germs are the active agents.
To name them, then, after this plan would be to wait some
days or weeks until after a post-operative or post-mortem di-
agnosis could be made. Teissier and his scholars, like Gries-
inger, have introduced the term purulent diathesis, and by the
use of it have explained certain cases of spontaneous septi-
cæmia and pyæmia. The very term indicates the necessity of

more accurate knowledge, and must be relegated to the past, although if it could be confined to a description, in an adjective sense, of lowered or increased susceptibility to certain organizations by which apparently suppuration is encouraged, providing the necessary germ to be present, it might be applicable. In 1871 Quinquand described under the name *maladie arthrito-phlegmoneuse*, an infection characterized by multiple suppurations about the joints and in the cellur tissue, and formulated the following conclusions: "There exists a disease of special nature, characterized by articular and phlegmonous lesions, which have a strong resemblance to each other, and this I propose to describe under the above name. It comprises three forms, *a*, the arthrito-phlegmonous form in which there are moderate fever, acute suppurative arthritis with rapid destruction of cartilages and epiphyses, and subcutaneous indurations which later suppurate; *b*, an articular form characterized by destructive changes limited to the joint; and *c*, a phlegmonous form in which the lesions are extra-articular, and occur in the cellular tissue. This disease is distinct from rheumatism, although it somewhat resembles it, and develops under the influence of fatigue, of certain traumatisms or burns, and sometimes from causes quite unknown." He publishes as an illustration of this disease the case of a robust man of healthy antecedents, who burned his arm one day and received an excessive fright. Soon after he had a violent chill, vomited, and became seriously ill, and developed the articular manifestations of the condition just described. Abscesses developed at various points, he rapidly grew worse, a bed-sore formed over the sacrum, delirium supervened, and the disease proved rapidly fatal. At the autopsy extensive destruction of the soft and hard tissues was found. From the standpoint of to-day it would scarcely seem necessary to erect a separate form of disease to accommodate such cases as these. Ample opportunity for infection was offered from the burned surface, while, undoubtedly, the emotional and nervous elements conspired to materially reduce his vitality. So in such a case as that brought forward by Tuffier, as one of sporadic or spontaneous pyæmia, in which a trifling uterine affection had been treated by very superficial applications of the actual cautery, which

were followed by very rapid fatal purulent infection. Even so, with such a case as one with which I was myself conversant, where the only explanation for a fatal case of pyæmia was afforded by the discovery of a minute but fatal bursal suppuration under a small soft corn. Surely for such cases as these it is no longer necessary to suppose a purulent diathesis, any more than it is for a case of septicæmia following a dissection wound.

Among the first to regard these mixed and secondary infections from the clinical side was Dr. Keen ("On the Surgical Complications and Sequels of the Continued Fevers." Four Lectures, No. V. Smithsonian Collections). A lively interest in the subject awakened by his paper prompted me to report a number of cases from my own experience, in 1885 ("Some of the Surgical Sequelæ of the Exanthems and Continued Fevers," *Canadian Practitioner*, July, 1885), working still from the clinical standpoint. Since the introduction of bacteriological methods these problems have now to be studied in a very different and even more interesting light. The two monographs which most fully cover the ground, in my estimation, are those of de Lapersonne, "Des Arthrites Infectieuses," Paris, 1880, and Witzel, "Die Gelenk und Knochenentzundungen bei Acut-Infectiosen Erkrankungen," Bonn, 1890, to which I desire to acknowledge large obligations, and to which I must refer for a bibliography of the subject.

I propose to devote the remainder of this course of lectures to a consideration of these secondary and mixed infections, following the more important or common infectious diseases which have most interest for the surgeon, hoping at least to be instructive and suggestive in the effort, but not claiming that it is in any sense exhaustive of the subject.

DYSENTERY.

Dysentery is one of the special diseases whose joint complications have been recognized from the oldest times. Mild forms of this trouble have been noted in a great many cases as a common sequel; but such disturbances as suppuration in the joints are quite rare.

In Hippocrates we find the following remark:

"*Intempestive suppressa intestinorum difficultas abscessum in costis aut visceribus aut articulis inducit.*" At least three authors in past centuries have noticed actual joint suppurations in epidemics of dysentery. These are Strack, Zimmermann and De la Cloture. Experiences of the extensive epidemic which raged in Minz in 1757, and for two years later, laid the ground-work for the treatise on dysentery in which Strack expressed himself thus: "If the dysenteric poison affects only the chest it causes asthma; if the limbs, it produces arthritis; if both, abscesses." Zimmermann saw in those remedies used to suddenly check the discharges the causes of those joint pains and swellings which so frequently occurred in an epidemic during 1765 in Canton Bern. During the same year De la Cloture observed an epidemic in Caèn in which, so soon as the intestinal symptoms subsided, there were frequently suppurations in the joints which often led to anchylosis, and sometimes to death. The same author alludes also to a very fatal epidemic of the same character two years later in Forges, as a result of which a large proportion of the surviving patients remained lame, or suffered very serious pains in the extremities. He regarded these lesions in the limbs either as a metastasis, by which intestinal affection was terminated, or else as a chronic expression of the dysenteric disease. The years in the middle of this eighteenth century appear to have been marked by dysenterous epidemics of the same general nature in various parts of Europe. During one in 1776 and 1777 in Berlin, Stoll frequently observed the intimate connection of joint inflammations and dysentery; with the sudden subsidence of the latter there were frequently joint neuralgias or swellings or other inflammatory phenomena. These were very frequently spoken of at the time as rheumatic pains and swellings, which denomination appears to have been unfortunate, since there was nothing then, nor is there now, to indicate a genuine rheumatic character for these troubles. Moreover, Stoll relates that he occasionally found pus in the joints. The generally painful nature of these complications will account for the statement found in many treatises that rheumatism of the joints is an occasional sequel of dysentery. Indeed

Trousseau instituted a rheumatic form of arthritis following it.
According to Trousseau, the joint symptoms were usually lim-
ited to the knee, and sometimes attained such a degree as to
lead to the destruction of the capsule.   A more nearly rheu-
matic character is given to these sequelæ by the fact that they
sometimes do assume a wandering character.

Post-dysenteric arthritis has in very recent times been noted
by Lecard in an epidemic at Rochelle in 1873–1874, who re-
ported eight cases; by Aron and Joigny in 1876, who saw four
cases; by Fradet, who in 1884 reported eighteen cases during
an epidemic at Vincennes.   Bérenger–Féraud in his treatise
on dysentery speaks of diverse neuralgias and reports a
case of arthritis along with conjunctivitis and cardiac complica-
tion.   On the other hand observers of large experience have
gone through other epidemics without seeing any such cases.

Thomas, of Tours, has furnished a rare instance of suppura-
tive arthritis consecutive to dysentery.   It occured in a lad of
twelve, the violence of whose dysentery was followed by an
eruption which resembled variola, on the second day articular
manifestations appeared in various joints.   By the fortieth day
suppuration in these joints was positive.   He yielded to the
violence of the disease, and on autopsy nearly all the joints
showed suppurative and some of them destructive lesions.

Post-dysenteric arthritis has given rise to much discussion
and several theories.   Thus Zimmerman was inclined to attri-
bute it to the bad effect of drugs administered during the dis-
ease.   It is still a question with certain writers whether there
is a special form of dysentery, or whether there is any real
identity between rheumatism and dysentery, or whether a
rheumatic diathesis can be intensified by intestinal inflamma-
tion.   Trousseau, for instance, admitted a rheumatic form of
dysentery, while some others, like Stoll, or even so far back as
Coelius and Aurelianus, believed in the identity of dysentery
and rheumatism, while among the advocates of the third or
latter view appears Thomas of Tours.   Trousseau in speaking
of the abdominal distress says that pain and tenesmus are more
extreme in these cases than in those of any other form, and on
the other hand it may be admitted that the great majority of

these individuals present neither history of previous rheumatic attacks nor of rheumatic antecedents.

Two French writers have shed considerable light upon this subject. Huette based his work on dysenteric arthritis not only on historical considerations, but upon a description of ten personal cases. Quinquand, writing upon rheumatoid manifestations of dysentery, refers especially to the ætiological aspects of the subject. Kraeuter, referring to a complicated case of this character, held that the joint lesion, as well as the conjunctivitis, sometimes noted, depended upon a putrefaction produced by immediate resorption of fæcal material into the blood. This, written in 1871, is but a more modern expression of views held a century before by Zimmermann and Stoll.

Rheumatoid affections of the joints usually occur in the period of convalescence after dysentery in either the epidemic or the sporadic form. They occur sometimes a few days, sometimes a few weeks later, and present themselves ordinarily in much the form of a common chronic rheumatism. Sometimes, however, the attacks are quite acute. According to Raymund exposure and violence or over use are the most common causes. Mildness of disease of the dysenteric form does not necessarily secure immunity from these later complications. Almost all writers on the subject agree that it is the more acute or rapidly running attacks of the former, which produce the later.

For instance, Huette reports the following case: The sickness of the mother was mild and lasted fourteen days; soon after apparent recovery she was seized with rheumatic pains, the shoulders swelled and then the wrists and elbows; soon after these the joints of the lower extremities, especially the ankles. She was confined to bed for two months, and went on crutches for four months more. A son of thirteen had, almost at the same time as his mother, a mild dysenteric attack. One month later after his complete recovery the joints of the lower extremity were attacked, the right leg became enormously swelled, and this swelling very slowly subsided. A younger son suffered at the same time from a very severe dysenteric attack, which caused the greatest anxiety. He recovered, however, without complications.

A study of the clinical features of these cases would seem
to imply that we have to deal rather with the intermediary in-
fection of the body juices by the poison from the intestinal
canal, than with a sudden flooding of the system by the same.
The fact that we have no severe general manifestation before
the joints are involved would seem further to bear out this as-
sertion. In no reported case has it been mentioned that there
were high fever or chill previous to the general symptoms
spoken of. The joints are not usually simultaneously involved.
One succeeds the other in irregular order, and severity of at-
tack varies with different joints in the same individual. As in
the case of post-gonorrhœal arthritis the knee is perhaps more
commonly involved. But it by no means is the only joint at-
tacked, and trouble is nearly as frequently met with in the
other larger or smaller articulations. According to circum-
stances we seem to have, in these cases of post-dysenteric ar-
thritis, degrees of severity amounting from simple arthralgia
to hydrops-articuli, suppurative synovitis, and complete de-
struction of the articular surfaces with pyæmic manifestations
and death. The effusion when serous or sero-purulent may
be trifling in amount, or very extensive. Trousseau states that
it may even cause rupture of the capsule. This condition ap-
pears seldom to be met with to-day in so severe a form as was
described one hundred years ago. Zimmermann states that in
Thurgau half the patients succumbed from joint affections,
and in Berlin, during the epidemic which Stoll described, there
was a large mortality, and pus was frequently found in the
joints. In cases reported of so-called post-dysenteric "rheu·
matism," a fungous, *i. e.*, tuberculous condition of the joints
affected has not yet been noted by any author. It is, more-
over, surprising that with so many destructive lesions in the
joints, so far as I can learn, no instance of serious primary in-
flammation of bone or of periosteum has been reported. Al-
though pus has been found in so many instances, old and re-
cent, and although Starcke, in 1877, found cocco-bacteria in
fluid removed by aspiration from such a joint, I have not been
able to learn of any reliable bacteriological study of such a
case, and consequently while maintaining the ground that we
cannot have pus without bacteria, I am unable to say whether

this pus is due to infection from the ordinary pyogenic cocci, or whether a specific or common form of bacterium from the intestinal tract is capable under some circumstances of wandering so far from its proper habitat, and producing pus within the synovial membrane. Certainly between the post-dysenteric and post-gonorrhœal forms of arthritis there is a certain analogy; but as we have already learned that the gonococcus is not a pyogenic organism, and that pus in these instances is produced only by a secondary pyogenic infection, so we may learn later that serous effusion may be caused by the microbe of dysentery, but that pus is produced only as in the other instance.

CHOLERA.

I find but very little literature indicating that cholera is followed by secondary infections. It appears to be too rapid in its course and too violent. Nevertheless, that it is not exempt may appear from the fact that during a recent epidemic of cholera Poulet, of the *Val-de-Grace*, had, in making autopsies, several opportunities to meet with articular and osseous lesions. He found, for instance, in a few, an effusion of fluid, sometimes as thick as molasses, and sometimes of a marked reddish tint. He spoke of it as sometimes resembling opodeloc balsam. Sections of the synovia showed epithelial desquamation with a layer of leucocytes replacing it.

HYDATID CYSTS.

That suppurating hydatid cysts have been accompanied by abscesses in other parts has of course long been known, but whether these be truly metastatic in the ordinary acceptance of the term, or whether their explanation is to be sought for in the usual way, the clinical fact remains—as well as the pathological probability—that these, too, are cases of secondary infection. For instance Verneuil has reported the case of a child with hydatid cyst in the liver, upon which he operated by puncture; shortly after the patient was seized with vague pains about the joints, and a confluent eruption of urticaria.

Later suppurative arthritis was set up about the great toe; violent chills were noted, the abscess was opened and finally the patient recovered. In such a case we certainly have to deal with a purulent infection, and to speak here of rheumatic infection would be simply to misuse terms. Moreover in this case the cyst was not suppurating at the time when it was punctured, although possibly the source of infection may have been introduced with the instrument; but even then to account for so distant an abscess is difficult, although numerous joints were involved in much slighter disturbances. It is known, however, that injection of the most limpid fluid from such cysts gives rise in animals to septic action, and one may well stop, with such a case, to inquire whether resorption of this liquid in Verneuil's case might not have given rise to general infection, with articular localization.

EDITORIAL ARTICLES.

THORNTON'S RECENT CASES OF HEPATIC SURGERY.[1]

A paper of no little interest by Mr. Knowsley Thornton was read before the medical society of London, in March. In this paper the author presented his experience of hepatic surgery up to that time in continuation of previous reports, which have been duly abstracted in this journal. Nine cases are detailed, in seven of which gall stones were diagnosed as the cause of illness, finding and removing them in seven, and finding and removing hydatids in one.

1. A woman, æt. 32, had suffered several attacks during a number of years, which had been ascribed to gall stones. The description given by the patient and the well marked renal and vesical symptoms which accompanied the attacks, as well as examination of the abdomen, tended, however, to indicate right renal colics; there was a rounded tender swelling projecting from under the false ribs on the right side in front, and giving an impulse right back into the loin, and, though there was some crepitus over the usual site of the gall bladder, there was no swelling there and no very marked tenderness. An incision over the swelling and rather to its inner side, however, discovered that it was the gall-bladder completely enclosed in matted omentum and intestines; a little bile-stained mucus having been drawn off by the aspirator, it was packed carefully round with carbolized sponges, and, through a small vertical incision, two large stones and some debris were extracted with forceps and lithotomy scoop Examination of the right kidney was made very difficult by the adhesions; it was large and hard, but not obviously diseased. The edges of the gall-bladder were

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[1]Cases of Hepatic Surgery. By J. KNOWSLEY THORNTON, M.D. (London), *London Lancet*, March 7, and April 4 and April 11, 1891.

sutured into the abdominal incision and drained in the usual way, and the patient made an excellent recovery.

2. A woman, æt. 37, had two severe attacks of colic; she had never been jaundiced, but the stools had been pale since the first attack. A healthy gall bladder was opened by the usual incision, dis closing two good-sized stones in the common duct. The cystic duct had contracted behind the stones so that it could not be dilated; the stones were needled into fine pieces by a needle through the wall of the duct, the fragments being further crushed with a pair of nasal polypus forceps, the blades of which were padded by rubber tubing stretched over them. The attempts at dilatation had so much injured the gall-bladder, that it was now decided to remove it. After the operation the patient was distinctly jaundiced, and for eight or nine days there was a good deal of bile in the urine, but the first motion passed was brown, and the fragments of stone began to pass on the eleventh day. The patient made a good recovery in a month.

3. A woman, æt, 40, had been suffering from symptoms attributable to the gall-bladder for six years, and was in a very enfeebled condition. Stone impacted in the common duct was diagnosed and, in view of her serious state of health, immediate operation undertaken. A large angular stone was removed from the cystic duct, after being broken, and another was found impacted in the common duct just below the cystic duct. The stone was then needled into fragments through an incision in the common duct, and as the fragments could not be extracted through any reasonable opening in the duct wall, the incision was closed, leaving them to pass *per vias naturales*. The edges of the gall bladder were stretched into the external wound, and the usual drainage provided, together with a glass tube passed into the peritoneal pouch below the liver. The patient made an uninterrupted prog ress to complete health.

4. A woman, æt. 35, presented a lump just below the liver, with pain, first noticed six years previously, just after child-birth. A number of gall-stones could be distinctly felt. These were removed by a simple cholecystotomy, the gall-bladder sewed into the abdominal incision and drained. A rapid and complete recovery ensued.

5. A woman, æt. 32, experienced sudden severe pain in recurrent paroxysms for an entire day followed by jaundice and yellow urine. Five months later, during a similar attack, a tumor was found in the neighborhood of the gall-bladder, and her medical attendant aspirated two pints of bilious fluid, after which he referred her to Mr. Thornton. The tumor refilled rapidly and the operator exposed it, and, after aspirating two and a half pints of bilious fluid, opened it and removed a quantity of hydatids, learning that it was the gall gladder. There were many adhesions all around it and a separate hydatid cyst was removed from the omentum; as there was fluid in the pelvis, a counter-opening was made over the pubis through which the peritoneum was drained by a glass tube. The gall-bladder was treated in the usual way, the pelvic tube was removed in thirty-six hours, the gall-bladder ceased discharging on the twenty third day, and complete recovery ensued.

6. A woman, æt. 43, much emaciated and deeply jaundiced, with the peculiar earthly bluish tinge often accompanying malignant dis ease, presented an indefinite swelling and dullness in the region of the gall-bladder, but more to the left than usual; the liver was large and hard with obvious matting of the parts below it. She had had the first colic nine months before, with severe pain at intervals for two weeks, followed by violent vomiting, complete anorexia and green jaundice. Impacted gall-stones was diagnosed and malignant com-plications feared. Abdominal section revealed a liver so large that the gall-bladder and the ducts were quite covered, much adhesion of omentum and intestines and a large oval stone impacted in the com-mon duct. Failing to define the gall bladder accurately, and it being impossible to get at the stones through the contracted cystic duct, it was decided to remove by incision of the common duct. This was much hampered by the large liver, the work being necessarily done entirely by touch deep in the abdomen, guiding the knife on the left index finger. The first incision was followed by such a rush of blood that the vena cava was suspected, but examination through a small Ferguson's glass speculum showed that it proceeded from a vein in the adherent omentum, which was easily secured. The stone was

loosened with difficulty on account of its adhesion to the lining of the duct over a great part of its surface. The opening in the duct was closed by six fine interrupted silk sutures and a continuous one over all, the omentum being used to strengthen the closure. The peri toneum was drained by a glass tube. In spite of serious shock, the patient rallied quickly, the wound healed in a fortnight, and after three weeks she was discharged, with only a slight jaundice, which disappeared five weeks later.

7. A woman, æt. 36, had long suffered from inactive liver with attacks of pain in the right hypochondrium, which during the last six months had become very severe and clearly due to the attempted passage of gall stones, and accompanied by vomiting, jaundice and emaciation. On operation two stones were found one above the other in the common duct. The gall-bladder was so shrunken that it was recognized with difficulty and it was decided at once to open the common duct, remove the stone and suture the opening, which was not easily done owing to the matting of the parts by adhesions; fearing for the security of the suture, a rubber tube was passed into the pouch at the bottom of which it lay and brought out through the upper part of the abdominal incision, a glass tube being also passed into the sac of Douglas through a counter-opening above the pubes; the latter was hardly required but a heavy discharge of bile stained serum flowing from the rubber tube for many days after the operation showed the wisdom of the precaution. Rapid and perfect recovery ensued.

8. A woman, æt. 34, had long suffered from attacks of pain around the back and in the neighborhood of the liver, lasting a few days and then passing off. A lump was presented in the region of the gall-bladder, said at times to be irregular in outline and so mobile that it was thought to be in the omentum and of malignant nature; this diagnosis was strengthened by gradual emaciation with constant pain and by her mother's, having died of internal cancer. When first seen a smooth oval tumor was found about as large as a turkey's egg and with all the characters of a distended gall-bladder. Seen again after a time, a much smaller, harder and more sensitive swelling was found, confirming the diagnosis but increasing the fear of malignant disease. Section

showed a very hard and thickened gall-bladder, which was laid open but no stone found.   The adhesions around it were so firm that it was difficult properly to explore the ducts from their peritoneal surface. They were so firm that on account of the ease with which the gall-bladder was cut, it was decided not to fasten it to the incision, but to suture it carefully and drop it in.   The patient did badly from the first and died on the third day with septic symptoms.   Autopsy showed that a large quantity of bilious fluid had escaped into the peritoneum through the giving way of the suture in the gall bladder wall, and close to the opening lay a small gall-stone free in the peritoneal cavity—a very small one to have caused so much trouble and such great thick-ening of the gall-bladder.

9. A woman, æt. 34, had for several years been subject to colics, which latterly had become recurrent at frequent intervals.   Abdominal section revealed the contents of the abdomen so matted together that the head of the pancreas was at first mistaken for a thickened gall bladder, which was at last, by carefully separating some fresh ad-hesions between the stomach, the omentum and the right lobe of the liver, found deeply placed and packed with gall-stones.   In the search a small abscess under the edge of the liver was opened giving exit to about an ounce of cheesy pus.   The clasping of the stones was long and difficult and required the aid of various scoops and forceps.   As in Case 7, it was found impossible either to remove the gall-bladder, suture it or stitch it into the abdominal opening, so a rubber tube was simply passed to the bottom of the gall-bladder and brought out through the abdominal wound; the gall-bladder being thus left open to the general peritoneum, a counter-opening was made above the pubis and the pouch of Douglas also drained with a glass tube, and the pa-tient made an excellent recovery.

At first sight it seems very dangerous to leave the gall-bladder open, but these two cases show that, with due care in the arrangement of the tube, and with auxiliary drainage of the pelvis, it may, when necessary, be done.   In both cases the wound in the gall bladder was slow in closing, due to the wide separation of its edges, but there was no evidence of any serious leakage from the gall-bladder into the peri-

toneum, though the discharge of bile-stained mucous through the rubber tube was very great from the first. The author supposes that, when the abdominal incision is sutured and the abdomen well strapped up, the adherent viscera around the gall bladder or duct press up to the parietal peritoneum and the fluids find it easier to escape through the open tube than to spread into the peritoneum between the surface of these structures; then in a very short time, a firm wall is formed all around the tube by the adhesion of neighboring surfaces.

During the period occupied by the foregoing cases Mr. Thornton also performed five exploratory operations in connection with hepatic disease. In the first case the results were negative owing to the extreme matting of the parts. In the second, a hard tumor in the region of the gall-bladder was found to be malignant. The third was also negative and the trouble has recurred leading to a suspicion that a stone might have been overlooked. In the fourth case the symptoms were due to a tumor, probably gummatous, in the location of the gall bladder. In the fifth case no gall stones were found, and the wound was closed after dividing some adhesions; the patient was relieved.

In considering the series of cases, the operator thought the results good, and amply justifying the operative measures. At the same time there is sufficient uncertainty and failure to show that future efforts should be directed to a more perfect diagnosis. With regard to gallstones the chief points to be noted are the sudden nature of the onset of pain and its equally sudden departure, the way in which it travels round the body and through into the back at the angle of the scapula, and the sense of constriction round the region of the diaphragm. The presence of a mobile, pear-shaped tumor in the situation of the gallbladder or to one or other side of that situation, which rises and falls with respiration, variations in size and tension of this swelling may make diagnosis pretty certain. These symptoms, suddenly complicated by jaundice, especially if a swelling previously present disappears, make it pretty certain that the stone has passed through the cystic duct and become impacted in the common duct.

In these cases three entirely new departures in hepatic surgery were made:

1. Direct incision of the common duct and removal of the stone with complete suture of the opening without opening the gall bladder.

2. Incision into the common duct, needling the stone into fragments and closing the duct over them so that they must find their own way into the duodenum.

3. Leaving the gall bladder open in the peritoneum with efficient provision for drainage through the abdominal incision in cases in which it is impossible to suture it into the abdominal wound, and not advisable to attempt complete intra-peritoneal suture.

In the latter case, and wherever fouling of the peritoneum was possible, he urged a counter-opening and drainage as in his seventh and ninth cases. JAMES E. PILCHER.

INDEX OF SURGICAL PROGRESS.

OPERATIVE SURGERY.

I. **Longitudinal Incisions in Resections of Foot and Hand.** By Dr. C. Studsgaard (Copenhagen). The transverse incision (Bardenheuer) through the extenson-tendons gives plenty of space in deeper affections of the anterior tarsal-region. Tuberculous bones and capsules may be removed with ease, but the final result is often unsatisfactory on account of adhesions of the severed tendons to the skin and cicatrix, and consequently impaired motion of the toes. If the tendons do not grow together, the toes may become permanently flexed and impair the function. To prevent this the author advocates his method in order to gain free access to the diseased focus in the anterior tarsal bones and the posterior ends of the metatarsal bones without severing the extensor-tendons. He splits the foot from before backwards between second and third toes, cutting through the ligamenta tarso-metatarsea and opening the capsule between the middle and external cuneiform bones. First and second toes with their cuneiform bones may now be moved inwards, third, fourth and fifth toes with the external cuneiform and the cuboid bones outwards, and the tarsus widely opened. It is now very easy to remove the diseased bones and soft tissues, and then suture the wound along the dorsum and planta of the foot. leaving a drain through the foot in the posterior angle. The only tendon severed is that of the peroneus longus, which crosses the incision in the planta on its way to the cuneiform bones and the bases of first and second metatarsal bones. No large arteries or nerves are severed.

The author mentions a successful case operated in this way, in which he amputated parts of the four inner metatarsal bones and re-

moved all the cuneiform bones and the navicular bone on account of tuberculous caries. The result was everything to be desired. The author claims the priority of this operation, having performed it two months before Abalinsky, who advocates the same method in *Central-blatt f. Chirurgie*, No. 43, 1890

The author recommends a similar section of the hand for tuberculous osteitis of the carpus considering this method superior to Lister's and Ollier's longitudinal incisions or to Butcher's and Stanley's transverse incisions. Lister's is probably the best of these, but does not give good space and the hæmostasis is often difficult if the deep arch is severed.

The longitudinal incision is made between third and fourth metacarpal bones and the joint between the os magnum and the cuneiform bone opened. The carpus many now be widely opened. It is easy to avoid the median, nerve except the branch to the radial side of fourth finger. Both superficial and deep palmar arches are severed and must be ligated in the wound.—(*Hospitals-Tidende*, Jan. 7, 1891.

H. MYNTER (Buffalo).

GENERAL SURGERY.

I. On the Surgery of Hydatid Disease. By DR. MIKHAIL S. STADNITZKY (St. Petersburg, Russia). A couple of years ago Professor A. S. Lebedeff and Dr. A. I. Andreeff, of St. Petersburg, have published (*Medical Chronicle*, June, 1889. p, 215) interesting experiments which prove beyond any reasonable doubt that daughter-cysts of human echinococcus, when transplanted into a rabbit's abdominal cavity, will continue to grow and even multiply. Following Prof. Lebedeff's suggestion, Dr. Stadnitzky has lately repeated the experiments, his results furnishing an additional support to the last proposition. The following are practical corollaries deduced by him from the instructive facts: 1, On operative interference in cases of abdominal echinococcus in man, the surgeon must take the strictest possible precautions for preventing any penetration into the peritoneal cavity of contents of echinococcus cyst, since otherwise daughter-bladders will grow and

multiply therein and thus give rise to all formidable symptoms peculiar to the disease. 2, In such cases of hydatid of the liver where there arise some suspicions that the maternal cyst has burst and its contents emerged into the peritoneal cavity, abdominal section should be performed without delay. 3, In view of the said dangers, an exploratory tapping, as a means for diagnosing abdominal hydatids in suspicious cases, should be either given up altogether, or, at least, practiced only in certain quite exceptional cases.— *St. Petersburg Inaugural Dissertation*, 1891, No. 22, p. 32.

NERVOUS AND VASCULAR SYSTEMS.

I. **On the Therapeutic Value of Nerve-Stretching.** By DR. ARCHIMEDE MISCHI (Cesena, Italy). The writer comes to the following conclusions:

1. Nerve-stretching constitutes, by its manner of action, a special therapeutic process. This influence is felt even as far as the nervous centres and in the medulla oblongata in particular. A paralysis of sensation, with relative conservation of motility, is produced.

2. Nerve-stretching is an efficacious method of treatment in those cases in which the lesion is peripheric; hence, it is most useful in the treatment of the various neuralgias, ticdouleureux, spasms, traumatic contractures and reflex epilepsy.

3. It must be condemned in tabes dorsalis and various affections of the medulla oblongata, in which it is never successful, often injurious and, finally, sometimes fatal.

4. It offers but the slightest probability of success in the treatment of tetanus.—*Il Raccoglitore Medico*, Dec. 10, 1890

II. **A Case of Supposed Arterio-Venous Aneurysm of the Femoral Vessels, at the Apex of Scarpa's Triangle; Ligature of the Femoral Artery and Vein, above and below, with Extirpation of the Sac; Recovery.** By PROF. D'ANTONA (Naples, Italy). At the operation there were found at the aperture of the sac villiform vegetations in a small perforation of the artery, and small fibrinous bodies floating freely in the sac. These two condi-

tions were the cause of the strong, continous fremitus characteristic of arterio venous aneurysm; whilst, really, there was not found any communication with the vein.—("*Annali di Chirurgia*; *Gazzetta degli Ospitali* (Lupplemento) IX. No. 12, 1890.")

ALBERT PICK (Boston).

III. **Case of Aneurism of the External Iliac cui ed by Compression.** By H. P. SYMONDS, F R C.S , (Oxford). A man, æt. 48, presented just above Poupart's ligament a marked pulsating prominence which was seen continued down the thigh as far as the apex of Scarpa's triangle; it exhibited uniform expansion and a marked systolic bruit was audible, and an aneurism of the external iliac was diagnosed. Under anæsthesia a Lister's abdominal tourniquet was applied on a line with the highest points of the iliac crests and a little to the left of the median line. On tightening it up, the aneurism ceased to pulsate though pulsation continued in the right limb. Pressure was kept up for seven hours and as the pulsation slightly returned in the aneurism upon loosening it, it was again applied for two hours longer when it was gradually loosened by giving the screw of the tourniquet a turn every fifteen minutes during the next three hours; it was then entirely removed, the aneurism showing no sign of pulsation and being firm and hard to the touch. The tumor from this time continued to contract and a cure resulted, complicated by some symptons of peritonitis and enteritis, while within a week in'lammation of both parotids appeared, the left being the more severely affected, so that two weeks after the operation, it was incised and a large amount of pus evacuated. —*London Lancet*, Jan. 10, 1891.

JAMES E. PILCHER (U. S. Army.)

HEAD AND NECK.

I. **A New Method of Determining the Position of the Fissure of Rolando.** By CHARLES L. DANA, M.D. (New York). There is no better method than that of Thane for finding the upper end of the fissure of Rolando, viz: Measure the distance from the glabella to the inion; find 55.7% of this distance, and the figures ob-

tained will indicate the distance of the upper end of the fissure of Rolando trom the glabella. As the naso occipital arc ranges from 28 to 38 cm. (11 to 15 inches), the point sought for lies from 15.7 to 26.8 cm. (6⅛ to 10½ inches) from the glabella.

The determination of the direction and length of the fissure is not so simple.

While the average angle made with the longitudinal fissure is 67°, and the average length 8.5 cm (3¾ inches), both of these figures are variable.

Mr. Horsley has devised an instrument by which the sharpness of the angle is decreased in dolicocephalic (long) heads, and increased in brachycephalic (broad) heads. But this instrument is expensive, and depends upon a principle which, though probably true, is not yet perfectly established.

The new method which I propose aims simply to locate the lower end of the fissure. It is this:

Find and mark the stephanion, *i. e.*, the point where the temporal ridge crosses the coronal suture.

Find and mark the concave depression just above and behind the tip of the mastoid process and just below the asterion or junction of the lamboid and temporo-parietal sutures.

Draw a line between these points. Find the bregma, and draw a line from it to the posterior edge of the external auditory meatus.

The point of crossing will be just over the lower end of the fissure of Rolando or within a centimetre of it.—*The Post-Graduate.*

II. **Hydatid Cyst of the Left Ventricle; Trepanation; Death From Basilar Meningitis.** By Dr. A. Castro (Buenos Ayres). A young man, æt. 14, farmer, had always been well until five months ago, when he began to complain of headache, followed by vomiting and paresis of the right arm and leg. There was hereditary diathesis in question. The family, consisting of eight brothers, are all living and in good health. His symptoms began five months before, with headache, vomiting, etc. These increased in frequency and intensity until October, 1889, when he entered the hospital at Buenos

Ayres. His condition at that time was as follows: Marked atrophy of the right leg, there being a difference of two and a half centimetres between the right and left thigh and calf. The difference between the right and left arm was five millimetres, between the right and left forearm fifteen millimetres. The dorsal interosseous muscles of the foot and the tibialis anticus were notably atrophied, as were also the hands. The general sensibility was preserved, although somewhat diminished; the reflexes were exaggerated, the temperature normal; appetite good when he had no headache. There was no deformity of the cranium. Patient refers the pain to the left side of the head. Although there was no history of hereditary syphilis, iodide of potash was given for a month, without any apparent results. The pains growing more intense, the vomiting more obstinate, and the paresis more marked day by day, an operation was decided upon.

After the necessary antiseptic precautions an incision was made and the trephine applied over the fissure of Rolando. Through a small opening in the meninges a blackish, soft substance protruded. Upon enlarging the opening in the cranium, a blackish tumor of the size of a walnut, covered by the meninges—congested but non-adherent—made its appearance. It was removed without difficulty with a curette, and, after carefully ligaturing all meningeal vessels, a drainage-tube was inserted and the wound dressed. The following six days passed uneventfully. The headache, vomiting and paresis seemed to have notably diminished, appetite improved, the wound was cicatrized and healthy, and the only discharge from the tube was some arachnoid fluid and softened particles of brain matter. On the seventh day, December 26, the discharge was slight, but there was a bulging outward of the membranes. On the following day it had increased to the size of a hen's egg, and on the third it was of the size of an orange. On December 31, the tube was removed, and a weak solution of boric acid injected into the wound, when suddenly the cicatrix gave way, and a large cyst, seven centimeters in diameter, was ejected. It contained two hundred granules of a clear yellow liquid with some flakes, which fell to the bottom of the vessel. The membranous walls of the cyst were easily separated, and were about two millimetres in thickness.

The inner surface of the cyst wall presented numerous whitish granulations, which, under the microscope proved to be echinococcus cysts, adherent to the germinating membrane, vesiculated and full of living echinococci. The day after the expulsion of the cyst the temperature fell to 40° C.; pulse, 120. On January 2, temperature, 41° C.; pulse, 130. On dressing the wound, another cyst of the size of a hen's egg made its appearance and was removed. An epidemic of diphtheria was raging at the hospital at this time, and the wound became covered with false membranes. The condition of the patient grew worse until January 13, when he died. Basilar meningitis was stated to be the cause of death. —*Annales del Circulo Medico Argentino*, 5. 1890.

III. Paralysis of the Left Upper Extremity and Left Side of the Face; Paralysis of the Left Lower Extremity; Trephining; Improvement. By Dr. P. Soderbaum (Falu, Sweden). Anna A. W., æt. 11, entered the hospital March 3, 1890. Without any other symptom than a slight headache, her left upper extremity three weeks before had become paralyzed, and a week later the paralysis had extended to the left lower extremity and left side of the face. At her entrance into the hospital the movements were still somewhat free at the shoulder-joint; the mobility of the elbow was quite reduced, while the hand could hardly be moved. Extension, supination and pronation were especially difficult. The hand could only be closed with much difficulty, and with the aid of the other hand. The fingers lay half flexed, with the thumb in the palm. If told to lift her arm her hand would fall as if flexed. Her left lower extremity was paretic, the sensibility not diminished; the left side of the face was paralytic and one corner of the mouth refused to respond to the will. the eye-muscles unaffected; both pupils normal and reacted equally well to light. Vision normal; no hemianopsia.

Ice was applied to the head, and iodide of potassium given internally. The facial paralysis disappeared partially; the extremities remained unaffected. In the last part of April convulsions made their appearance, the paralysis of the lower extremity, really due to a rigidity of the muscles, became somewhat worse. The use of the lower

extremity was lost entirely; vomiting attacks began on May 19, when her sensorium became less clear; during two days she vomited uninterruptedly. She became apathetic; complained of being chilly, and of an oppressive feeling throughout her body. Although somnolent, she answered questions hesitatingly. During the time she was fully conscious the motor zones of the right hemisphere were somewhat painful to percussion. No preceding trauma was known to have existed. Neither had a purulent discharge from the ear or nose been remarked. Trepanation was performed, by means of a chisel, in the upper portion of an oval incision, running upward from the fissure of Rolando, and the dura exposed. The pia was found thickened at a spot, but otherwise healthy. The brain pulsated normally, and its consistence presented nothing abnormal. A tenotome was then thrust several times into the brain to the depth of three centimetres; quite an amount of serum, slightly mixed with blood, followed these punctures. This was soaked up by means of sterilized cotton, the dura, bone-plate and scalp replaced.

May 26, the patient's mind was clearer; the rigidity of the leg-muscles less; no vomiting. The general condition of the patient gradually improved. The rigidity of the left leg diminished, and the active movements improved. The muscles of her hand also regained in power. July 2, she could walk across the floor. July 17, all movements of the hand and arm could be made, but the strength of the muscles was weak, especially in co ordinate movements. A paralysis of the shoulder-muscles of the left side followed the operation, due, undoubtedly, to a lesion of the centre of the left deltoid muscles, but this was only transitory, as already, nineteen days after the operation, the muscle regained its activity. Although the patient was not entirely restored to a normal condition by the operation, the result is quite satisfactory and leaves but little to be desired. The author suggests the presence of a small cerebral cyst, which walls, punctured by the tenotome, became adherent to each other after evacuation of the contents; otherwise he cannot explain the favorable course of the case after operation. He rejects the assumption of the existence of a circumscribed meningitis as insufficient to cause the paralysis. The re-

placed piece of bone healed in well; its borders may be determined by careful palpation. He would regard a trial trepanation of the cranium under the same or similar circumstances as justifiable.— *Upsala Lakareforeningsforhandlingar*, Bd. 27, Hitena 1 and 2.

IV. Cortical Epilepsy Localized in the Right Motor Zone, Especially at the Base of the Ascending Frontal Convolution; Trepanation with Replacement of the Disc; Recovery. By DR. CUNEO (Genoa). The writer describes the fol lowing case: G. B., æt. 17, born in Monaco, while on his way to Genoa, was seized with an epileptic fit, and was found stretched out and insensible on the ground; he was transported to the hospital Pammatone.

It was discovered that at the age of 7 years, after a severe trauma-tism inflicted upon the right parietal region, he commenced to suffer from epileptiform attacks; these usually repeated themselves at intervals of eight to ten days. No history of marriage of near relatives.

December 15, he was seized with an epileptiform convulsion. He was very excitable, snappish, slovenly in eating and drinking; he would not bear discipline; was irascible, and quick to threaten or injure. There was hemiparesis of the muscles of the left half of the face. On the right parietal region there were two linear, almost parallel cicatrices, about three centimetres apart, directed forward and outward. A depression corresponding to these, and six centimetres in length, with its posterior-superior extremity one and three-fourths centimetres from the sagittal suture, was also discovered.

December 21, 1890, a curved incision, with its convexity upward and about fifteen centimetres in length, was made in the right parietal region, dissected away and turned down. A large trepan, with a crown four centimetres in diameter, was applied; the pericranium incised around the edge of the crown of the trepan, that portion near the path of incision turned back. In the sulcus thus made the trepan was allowed to play. A disc, four centimetres in diameter, covered externally by periosteum, and presenting on the internal surface a fissure, one and a half centimetres long, as well as two slight bony elevations,

about five to six millimetres in height.   The disc was trimmed with the
bone-forceps, and the small prominences removed.   On digital explo-
ration of the internal surface of the cranium, the two elevations were
found to be continued on the internal surface, the lower ridge corres-
ponding to the base of the ascending convolution.   Eleven small discs
were removed before this ceased; examination of each of these pieces
showed the same line of fracture as the large disc.   The result of this
operative procedure was a defect in the cranial bones, of an irregular
oval form, with its greatest diameter from behind forward, and meas-
uring from above downward six and three-fourths centimetres.   The
dura mater was only somewhat more vascular than normally.   The
wound was disinfected, the pericranium was stitched together, after re-
placement of the large disc, the cutaneous wound sutured, dressed an-
tiseptically, and a slight degree of compression employed.   The pa-
tient was then put into a straight jacket.

December 23, the wound was re-dressed.   A pulsation was noticed,
which centre corresponded to the replaced disc.   Pulse regular; tem-
perature 37.2° C.   No epileptiform attacks.   He entirely changed in
his ways.   He became quiet, obedient, and asked to be taken out of
the straight-jacket.   The wound healed by first intention; the pulsa-
tion decreased and became limited to the place where the small discs
were removed. The large disc became solidly fixed.

On January 1, the patient left his bed, having shown, thirty-one days
after the operation, no signs of an epileptiform convulsion; his docility
was remarkable, in contrast with his former disposition; indeed, he
seemed a regenerated individual.—*Gazzetta degli Ospitali,* No. 10,
p. 79, 1891.

**V.   Trepanation of the Cranium for Traumatic Epilepsy.
Recovery.   By DR R. PEDRAZZI** (Naples).   The writer described
the following case: The patient, at the age of six months, fell from a
ladder and lay comatose for 24 hours; he recovered, however, appar-
ently completely, and remained well until his fourth year.   Epileptic
fits then made their appearance, which repeated themselves every ten
to fourteen days.   Finally, they grew so frequent as to force him to

enter a hospital. On the posterior portion of the right temporo-parietal region a depression, three centimeters in length, running backward and downward, was discovered. This was felt to pulsate at its deepest part. The sensibility and power of the left arm were diminished; sight and hearing were also, on the same side, below the normal. Thermic and electric sensibility were unchanged. On March 3, Prof. Tansini operated, employing the flap incision. The pericranium and dura mater were found adherent in the osseous fissure. The opening was enlarged with the chisel and the adhesions separated, during which the dura mater was torn through. Slight hæmorrhage took place from a branch of the middle meningeal artery. The wound was tamponed and closed by the skin flap and a temporary dressing applied. After twelve hours, the dressing having become soaked, it was renewed. The tampon was removed after twenty-four hours, and a secondary suture applied. The further course of the wound was uneventful; it healed by first intention in six days. Fifty-five days after the operation the fits had ceased to appear; vision in the left eye and sensation in the left arm had improved. The piece of bone removed by the trephine was covered on the inner surface with osteophytes. In trepanation the writer recommends the excision of a flap as done by Tansini.—*Gazzetta Degli Ospitali*, No. 39, 1890.

VI. Case of Traumatic Epilepsy; Trephining; No Lesion Found; Cessation of the Fits. By Dr. MAGLIONI (Buenos Ayres). A young man who always had been in good health, and never had suffered from any nervous affection, fell, striking his head against a nail, and soon afterward was seized with epileptic convulsions. The wound was located over the superior posterior portion of the parietal bone.

He was very taciturn; complained of headache, palpitation of the heart, but there was neither paralysis nor disturbance of general sensibility. The attacks, which were of the true epileptic type, were general and not localized. They made their appearance from once to several times a day.

Trephining was performed, but neither fracture nor depression was

found; the dura was not congested; no abnormal condition of the underlying brain substance could be detected. The wound was dressed antisept*i*cally and healed nicely. Five weeks afterward, March 15, an attack occurred; March 17 he had three attacks; April 28, two attacks, and April 30, one attack. From that time up to reporting the case, May 20, the patient had been free from any epileptic seizures. The writer wished to draw no conclusions from this case, but feels compelled to say that in cases of traumatic epilepsy trephining is justifiable.—*Annales del Circulo Medico Argentino,* 6, 1890.

A. PICK (Boston).

VII. Trephining for Traumatic Epilepsy Developed Fourteen Years after a Fracture Produced by Forceps at Birth. By W. ARBUTHNOT LANE, F.R.C.S. (London). A youth, æt. 16, on the right side of whose skull a depression had been produced at birth, developed epilepsy at the age of 14, and during the following two years the convulsions recurred frequently. Examination revealed on the right side of his head a groove, about three and a quarter inches long, extending from an inch behind the coronal suture to about the same distance in front of the lambdoid. The floor of the depression did not appear to be more than a quarter of an inch below the general level of the scalp. The left arm was weaker and clumsier than the right, and the left side in general was inferior to the right. Ankle clonus was highly developed, particularly on the left, while the knee, plantar and abdominal reflexes were much exaggerated. The eyes appeared to be normal. Exposure of the whole depressed area revealed abnormal vascularity of the bone. The floor of the depression, together with a portion of the surrounding margin of bone, was removed with a gouge and Hoffman's forceps. The depressed bone was very thin and vascular, while that about it was normal. The floor of the depression did not seem to be concave on its under surface, but flatter than normal, and therefore, apparently encroached but very little upon the intra-cranial cavity. The dura mater and the subjacent brain were quite normal in appearance. On account of the free hæmorrhage from the bone it was necessary to use a drainage tube for the first twenty four hours, but the wound healed by primary union. While

he has not been free from fits since the operation his condition has greatly improved, and it is hoped that the fits, which have become comparatively slight and infrequent, may soon cease altogether.— *London Lancet*, Jan. 17, 1891.

VIII. A Case of Intracranial Aneurism Successfully Treated by Ligature of the Common Carotid Artery.

By CHAUNCY PUZEY (Liverpool). A man, æt. 37, fell from his horse on to the side of his head, as a result of which he was unable to see clearly unless he covered one eye and he continually heard a puffing noise in his head. Examination revealed a loud aneurismal bruit on the left side of his head, loudest in the temporo-parietal region, immediately over the left ear and extending forward; it was stopped by pressure on the left carotid. Intracranial aneurism was diagnosed and treated with marked benefit to the patient.

After neglect of treatment by the patient for a year, however, all the symptoms were intensified. There was a swelling in the left orbit, about the size of a Tangerine orange, the eyeball in the center of it being much protruded and congested, the cornea hazy and at one point showing tendency to necrosis. The whole swelling pulsates and the pulsation can be controlled by pressure on the left common carotid. A loud bruit can be heard all over the left side of the cranium, from the middle line as far back as the posterior parietal region, but loudest in the supra-orbital and anterior temporal regions. The sound was of a swishing character, although the patient described it as resembling the booming noise or thud of machinery, preventing him from sleeping except when quite worn out by exhaustion.

To relieve the condition, under full antiseptic precautions, the left common carotid was ligatured above the omo-hyoid muscle with stout chromicized catgut; the wound was closed with silver sutures, a thin horsehair drain being laid from end to end, and a small rubber drainage tube being passed into the deepest part of the wound. Pulsation ceased in the swelling as soon as the ligature was tightened and never reappeared. The patient recovered fairly well from the operation, delayed at one time by a small accumulation of pus in the wound and

a troublesome sinus, while the cornea gave way and the iris became adherent. A year later he wrote that the noise in his head and the swelling about his eye had entirely gone, and that he was quite comfortable in every way.—*London Lancet*, Feb. 14, 1891.

IX. Removal of an Aural Polypus by Perforation of the Mastoid Cells. By MARMADUKE SHEILD, F.R C S. (London). A young man was admitted to hospital with a diagnosis of cerebral disease. Examination, however, revealed a large, friable vascular polypus, of the color of a ripe raspberry, filling the right auditory canal, on which side absolute deafness existed and a large amount of pus was excreted there. Removal through the mastoid cells having been decided upon, a free vertical incision was made over the right mastoid and the soft parts and periosteum turned back from the bone on either side. An opening was made immediately behind the upper margin of the external meatus by means of a small sharp gouge and mallet. The bone was exceedingly hard and dense, and the opening was cautiously deepened nearly one-eighth of an inch before a blunt director passed into the mastoid cells. Very free bleeding occurred as soon as the cells were opened, the blood welling out in a continuous stream as though some large vessel had been ruptured; a strong syringe filled with hot boracic lotion was applied to the aperture, driving blood mixed with a quantity of thick pus and masses of debris from the auditory meatus, and the bleeding soon ceased spontaneously. The polypus was next removed by a pair of ring forceps and the incision behind the ear united with horsehair, a drainage tube inserted into the opening made in the bone. The operation was followed by relief of all pain and disagreeable sensations in the head and side of the neck, and the patient made an uninterrupted recovery. The after treatment consisted of washing through the mastoid with warm boracic fluid and the application on three occasions of pure chromic acid to the remains of the polypus, which had grown from the interior of the tympanum through a large perforation in the membrana tympani. A month after the operation the chasm had apparently healed and hearing was for practical purposes perfect.—*London Lancet*, Feb. 7, 1891.

X. The Administration of Anæsthetics in Oral and Nasal Surgery. By FREDERIC HEWITT, M.D. (London). The author's experience as anæsthetist at the Charing Cross and Dental Hospitals has developed the following points:

Ordinarily it is best to anæsthetize the patient with ether and to keep it up with chloroform, care being taken not to make the substitution until the patient begins to show signs of emerging from the ether narcosis. The advantages of the ether are: (1) It is possible to fill the patient with such a quantity that for many operations it is not necessary to add more than to produce profound narcosis. (2) There is no objection to having the patient's head elevated or even to the sitting posture. (3) Should any difficulties—dependent upon the presence of morbid growths, etc., in the nose or mouth—arise during the administration of ether, there is not that liability to circulatory depression which exists during the use of chloroform under similar circumstances.

Where the position of the patient is left to the anæsthetist, he should place the patient in the position most favorable for the escape of blood. Aside from the inconvenience of the presence of blood, much discomfort from nausea or vomiting, due to swallowing blood, may be avoided. When considerable bleeding is anticipated, one of two positions should be chosen, if possible. (1) The etherized patient should be slowly raised into the sitting posture and his head and shoulders thrown well forward; or, (2) he should lie on his side with arm under him and, his head being near the edge of the table, his face should be directed downward, the mouth being well opened by some form of gag in either case.

Should there be complete or nearly complete nasal obstruction place a mouth gag between the teeth before beginning the administration; partial occlusion is liable to become complete during anæsthesia, by reason of increased vascularity of parts. When respiration prior to anæsthesia is embarrassed for any reason the administration should be very cautious and the breathing watched.

Otherwise, when the required degree of narcosis has been reached, the mouth should be opened by some form of gag. In cases where

there is very free hæmorrhage, it is best not to maintain very deep anæsthesia, the abolition of the corneal reflex not being necessary as a general rule. In very delicate operations, however, as well as those in which the bleeding is slight, deep anæsthesia should be kept up throughout the operation.—*London Lancet.*

XI. Stenosis of the Larynx and Trachea Following the Use of a Tracheotomy Tube By BERNARD PITTS, F.R C.S. (London), and WILLIAM E. BROOK, F.R.C.S (London). In most cases the difficulty in restoring respiration to the natural channel after the removal of a tracheotomy tube is due to lack of confidence on the part of the patient, and the trouble is readily overcome by suitable encouragement, but in occasional instances the canal may be occluded by a definite mechanical obstacle. The authors relate four cases of the latter condition.

1. A boy, æt. 3, was sujected to tracheotomy, Dec. 14, 1886, for extreme long continued dyspnœa the cause of which was never quite clear; after several unsuccessful attempts, the tube was removed two months later, the child having had meanwhile a sharp attack of scarlet fever, but the difficulty in breathing again became so marked that the operation had to be repeated nine weeks later. After seven weeks, it being found impossible to dispense with the tube, treatment by Macewen's tracheal catheters was tried, the tracheal opening again being allowed to close, but without success, tracheotomy being again required seventeen weeks later. He now wore a silver tube for a little more than a year and a quarter when renewed efforts to omit the tube were made but with entire failure, dyspnoea soon following. Intubation was also unsuccessful and accordingly, under anæsthesia the tracheal wound was extended upward and the thyroid partially divided. Retraction of the parts with blunt hooks showed a rather thick, pinky white band of fibroid tissue, which started from just below the ends and extended obliquely downward from right to left, thus forming a sort of diaphragm which nearly blocked up the lower aperture of the larynx; a general over growth of fibroid tissue was also found around the upper end of the trachea which was here seen to bend backward.

This band was now dissected out with curved scissors together with as much of the surrounding fibroid thickening as possible. A long curved tracheotomy tube was introduced and retained for ten days, but the tendency to difficult breathing again reappeared and a month later tracheotomy was again demanded. After wearing the tube for two months it was determined to again try intubation and under anæsthesia, the largest size O'Dwyer tube was inserted and retained three days; this manœuvre was again repeated once each for about twenty minutes, during the following three months. when the patient was discharged cured. The lesson taught by this case is that with failure by simple intubation to restore the natural passage. a free exploration of the tracheal wound should be made and all cicatricial tissue at once thoroughly removed, thus preparing the passage for intubation, which should then again be employed and repeated occasionally until all tendency to recontraction has passed away

2. A boy æt. 9, with membrane on soft palate and dyspnœa was subjected to high tracheotomy with relief to his respiration. During the next three months all attempts to remove the tube were attended by immediate distress, even when an anæsthetic was used. The tracheal wound was then enlarged, exposing a quantity of granulation tissue at the front and sides of the trachea at the lower border of the wound; this was removed with scissors and sharp spoon The largest size intubation tube was then introduced and, although it was soon coughed out necessitating the reintroduction of the tracheotomy tube, the tube was readily replaced the following day and retained for a week when, the surface laid bare by the removal of the granulation tissue having completely healed, it was not reinserted. The tracheal wound healed readily and the patient was discharged cured.

3. A boy, æt. 3, who had been subject to tracheotomy for diptheritic dyspnœa four months previously, was for two months subjected to intubation repeated at short intervals, the tube being retained for from three to six days each time. The removal being invariably followed by alarming dyspnœa, the tracheotomy wound was enlarged, six and a half months after the original operation, discovering at the level of the tracheal opening a dense collar of cicatricial tissue encroaching on the

lumen of the trachea; the trachea at the same time appeared to bend backward, the part below forming an angle with the part above the obstructing collar. The cicatricial tissue was dissected away very freely together with the lining of the operative opening and a tracheotomy tube again introduced. Intubation was now resumed and persisted in for several months with great improvement, when, the parents being satisfied with the child's condition, he was not brought for further treatment. On examination, a year and a half from the original tracheotomy, some stridor and dyspnœa were still present on exertion while phonation could be accomplished only by great effort

4. A boy, æt. 14, who had been subjected to tracheotomy five years previously and who had worn the tube continuously since then, after entire failure of intubation was anæsthetized and, after enlargement of the wound, was found to present in the trachea, just above the level of the tracheotomy tube, a collar of cicatricial tissue forming a web with an aperture toward the right side of the mid-line. After dilating the aperture with probes and catheters, an intubation tube was passed by the mouth; the end appeared opposite the wound, but projected forward against the lower border of the tracheal wound; it was therefore removed and the tracheotomy tube replaced. A few days later, Mr. Morgan divided the collar vertically with the scissors in two or three places, after which a large intubation tube was passed. A month later, it having been found impossible for the boy to retain the intubation tube for any prolonged period on account of the point of the tube pushing against the anterior wall of the trachea, in two operations, two months apart, the cicatricial collar was completely dissected out and intubation practiced during the ensuing six months, with almost entire relief to the dyspnœa and phonation although with an effort. The case will require further intubation and, owing the patient's age, with a larger sized tube than has yet been employed.

The authors conclude from these cases that when ordinary means of making possible the removal of the tracheotomy tube have failed, intubation by O'Dwyer's method should be tried and if difficulty ensues or no defintite improvement speedily ensues, then a thorough exploration of the parts should be made, cicatricial tissue should be freely and com-

pletely removed and intubation should again be employed before time for recontraction has elapsed.

With regard to the use of intubation in these cases the authors dwell upon the following points:

1. While with acute inflammation any attempt to use force in introducing a tube would be likely to end in disaster, in these stricture cases a certain amount of force is absolutely necessary.

2. A much larger tube can be tolerated, and is desirable, than is laid down for the treatment of acute cases.

3. The tube can be left in as long as a fortnight in some instances without injury.

4. Pulp food was found to be the best immediately after the begin· ing of intubation, fluids causing cough. After a short experience all the patients were able to take ordinary diet without any trouble.— *Lancet*, Jan. 10 and 17, 1891.

JAMES E. PILCHER (U. S. Army).

XII. Galvano-Cautery in the Treatment of Some Forms of Hypertrophy of the Tonsils. By DR. VITTORIO GRAZZI.

The author has used galvano-cautery in the treatment of the above mentioned affection and chronic follicular tonsillitis, and the excellent results which he has obtained cause him to emphasize the importance of this method of treatment and to recommend it to the profession; the more as it has not, up to now, received the attention which it deserves. In regard to the indication for the use of the cautery, the author states that if the tonsils be of large size, round, movable and projecting from between the pillars of the fauces it is better to operate with the tonsillotome; but if the tonsils are not very large, and especially if the irregular forms of hypertrophy with adherent tonsils are in question, covered partially by the anterior fauces and extending downward toward the base of the tongue, the author does not hesitate to give the preference to the galvano-cautery. The latter method is, also, indicated in persons who dread an operation in the cavity of the mouth or in the throat, in anæmic individuals where a reduction in the size of the tonsils is desirable without loss of blood, which latter is sometimes abundant after operation with the knife.

The galvano-cautery is, also, of incontestible value in the treatment of chronic follicular tonsillitis, where the enlargement of the tonsils is not considerable. In these cases a few applications of the galvano-cautery to the parenchyma of the tonsils will suffice to bring about such a change in the structure of this organ as to render a subsequent enlargement, which previously followed the slightest causes, very difficult.

The author expresses the superiority which galvano-cautery has over the thermo-cautery of Paquelin, in the treatment of the above mentioned affections, in the following words: "The galvano cautery may be introduced cold into the crypts of the tonsils to be cauterized; the current may be interrupted and turned on at any time during the operation, and only a very slight degree of radiating heat is given off by the galvano-cautery in comparison with the thermo-cautery. These circumstances speak for the inferiority of the thermo cautery. The sensibility of the mucous membrane of the mouth, also, complicates disagreeably the use of the thermo-cautery; and thus, through resisting movements of the patients some part, the mouth, tongue, etc., might easily be injured. All these disadvantages are not connected with the use of the galvano-cautery which can be carried cold into the floor of the mouth. Although he does not recommend extensive cauterization, the beneficial effects of the use of galvano cautery manifest themselves even after its first application.—*Gazzetta Medica di Roma*, No. 17, 1890, p. 423

A. PICK (Boston.)

XIII. **Extirpation of Larynx and Pharynx with Formation of a New Pharynx by Aid of Skin-Flaps.** By DR. K. POULSEN (Copenhagen). The patient was a man, æt. 56, who entered the Kommune Hospital on October 5, 1889, with a cancerous tumor in cavum laryngo pharyngeum of eight months' standing. He was emaciated and cachectic, unable to swallow anything but fluids and suffered great pain by deglutition. With the laryngoscope a considerable œdematous swelling of the arytenoid cartilages and the ary-epiglottic folds was discovered. Behind the larynx the upper segment of

a growth was seen, as broad as the larynx and reaching up to the arytenoid cartilages. Although it was evident that both larynx and pharynx would have to be sacrificed, operation was decided upon. After preliminary inferior tracheotomy subhyoid pharyngotomy was performed. The epiglottis was pulled forward and the growth examined with the finger. It was found surrounding the pharynx as a ring but did not extend below the cricoid cartilage. It was therefore decided to extirpate both larynx and pharynx. Longitudinal skin incision from the middle of the pharyngotomy incision to one-half inch above the tracheotomy wound combined downward with smaller lateral incisions. The two quadrangular flaps were dissected free to the middle of the sterno cleido mastoid muscles, the muscles loosened from the larynx and the pharynx from the vertebra with blunt instruments. The pharynx was thereafter severed one centimeter above the tumor, the œsophagus one centimeter below and lastly the trachea below the cricoid cartilage. The bleeding was insignificant The two skin flaps were thereafter united in the middle line in front of the vertebra with silk sutures, which included the pre-vertebral connective tissue. The upper and lower margins of the flaps were united with the posterior incisions of the pharynx and œsophagus. An œsophageal tube was introduced through the nose down into the severed œsophagus and the wound plugged firmly with iodoform gauze.

No reaction followed, the wounds healed everywhere, and a new posterior pharynx wall was formed. The tube was removed from the nose in a few days and was thereafter introduced three times a day into the œsophagus in order to nourish the patient.

The patient felt well and was up and around in ten days. The wounds were healed, but upward there was an opening into the pharynx through which the saliva ran downward in a steady stream, and downward the openings into the œsophagus and larynx were seen. The newly formed posterior pharynx wall had intact epithelium.

Three weeks after an anterior pharynx wall was formed by operation. A skin flap was made on each side by aid of a longitudinal and two horizontal incisions. The flaps were turned inward and united by sutures in the middle line with their epidermis backward. Upward

they were united with the anterior part of the defect into the pharynx, downward with the anterior margin of the œsophagus.

The patient was immediately able to swallow fluids and continued so for three or four days, when gangrene occurred of a small piece of the flap next to the œsophagus, leaving a little opening. The rest all healed by first intention, and the result was a perfect anterior pharynx wall with the exception of the little opening mentioned. If this was closed with a tampon, he could swallow milk perfectly, but occasionally some of it ran out through the opening and down in the larynx.

Several unsuccessful attempts of closing this little defect were made and the patient succumbed to a septic pneumonia after such an attempt (seven weeks after the first operation).

At the post mortem the newly formed pharynx was six centimeters long and nine centimeters in circumference. The epidermis was intact and commenced downward to look like a mucous membrane.

The cause of the defect was the difficulty of freshening the septum between the larynx and the œsophagus and of properly uniting the flaps to the œsophagus on this point. In a similar case the author would recommend to loosen the flap during the first operation so freely that it may reach the anterior margin of the severed œsophagus. If we succeed on this point the rest of the operation is comparatively easy. The author feels sure that it is possible to form a new pharynx by this method, through which normal deglutition may take place, particularly of fluids.

Solid food can probably not pass as the new pharynx lacks muscles. The same method may also be used in extirpation of the larynx alone, when the anterior pharynx-wall has to be sacrificed too —*Centralblatt f. Chirurgie.* No. 1. 1891.

<div align="right">HERMAN MYNTER (Buffalo).</div>

XIV.   Osmic Acid in Goitre. By Dr. S. AUERBACH (Russia). The author relates the case of a young woman of 25, suffering from goitre (the variety and dimensions not stated), in which he resorted to a "combined method" of treatment, including, *a*, a parenchymatous injection of a solution of osmic acid (1 grain to 2 drachms of distilled

water), a syringeful once daily or every other day; *b*, local massage, for 15 minutes, once daily, and, *c*, the internal administration of iodide of potassium.   By the end of three weeks all subjective symptoms disappeared, while the tumor was found to have greatly decreased in bulk (was half the size comparaed with the period before the treatment).   Unfortunately, the woman was subsequently lost from sight. —*I etopis Khirurgitcheskaho Obshtchestva v' Moskve*, No. 6, 1890, p. 505.

VALERIUS IDELSON (Berne).

CHEST AND ABDOMEN.

I.   A Method of Removing an Acute Pneumothorax, Resulting from Penetrating Wounds of the Thorax. By Dr. WITZEL.   The pneumothorax is a dangerous complication of penetrating wounds of the chest, partly interfering with respiration, partly with the circulation by pressure on the heart and large vessels.   The author recommends his method, which was tried in a case in Trendelenburg's clinic.   His idea is to change the pneumothorax into an artificial hydrothorax and then to empty this by aspiration.

The bleeding having been arrested, a male catheter of metal is introduced into the pleural cavity through the highest points of the wound, its beak being parallel with the chest wall.   The wound is thereafter closed by sutures, both air- and water-tight, with the exception of a little opening at the highest point.   The pleural cavity is now generally filled with a solution of boracic acid, of the temperature of the blood, till all the air is expelled through the catheter, and all the fluid is then removed by depressing the irrigator, which then acts as a syphon.   The case treated in this way progressed very favorably.   The respiration was quiet and regular after the operation, the percussion and auscultation normal. —*Centralb. f. Chirurgie*, No. 28.

HERMAN MYNTER (Buffalo).

II.   A Case of Large Pulmonary Abscess Surgically Treated.   By FRANCIS W. GREENE, M.B. (Mallow, Ireland.)   A boy, æt. 6, with a history of pneumonia with hepatization of the left

lung, the anterior portion of which failed to clear up, presented hectic in the fourth week with purulent expectoration. In the fifth week, about half a pint of pus was suddenly expectorated. The patient had complained of pain at a point in the anterior axillary line between the fifth and sixth ribs, where tenderness was found on pressure, and apparently bulging, without reddening of the skin, and with gurgling rales after the expectoration. Two days later, the physical signs having indicated that the abscess had filled again, under chloroform and with antisepsis, a fine trocar and canula was pushed slowly between the ribs, the trocar being withdrawn twice to see if pus exuded; the abscess was reached at the depth of a little over an inch. The pleural surfaces being adherent, with the canula as a guide, an incision was made parallel to the ribs about an inch and a half long; a trachea dilator forceps pushed through the wound and opened; when there escaped about a half a pint of pus. When the abscess was empty, air escaped with each expiration. The wound was drained and dressed. The hectic cough and expectoration disappeared at once, the character of the discharge rapidly improved and disappeared, so that the incision was closed on the twelfth day, and entire recovery soon followed.—*London Lancet*, Jan. 24, 1891.

James E. Pilcher (U. S. Army).

III. **Aseptic Laparotomy.** By Dr. H. Fritsch. The author, taking advantage of the fact that all known antiseptic substances disturb to a greater or less extent the function of the cells, renounces these entirely, using only the normal salt solution, and sterilized water, in laparotomy cases. The results of 52 abdominal sections, performed between February and July of last year, seem to bear out the truth of his assumption, that strict asepsis should take procedence over antisepsis. The method consists in thorough cleansing of the operation field, the hands of the operator and assistants, and, in fact, everything coming in contact with the wound. From the moment of making the incision until the final closure of the wound, no chemical disinfectant is allowed to come in contact with the parts involved in the operation. Sponges, compresses and instruments are steam sterilized;

during the operation the sponges and the hands of the operator are cleansed with sterilized salt solution.—*Centrbl. f. Gyn.*, 1890, No. 29.

GEO. R. FOWLER (Brooklyn).

IV. Permanent Drainage of the Peritoneal Cavity in Chronic Idiopahic Perionitis. By Dr. LUIGI CARVI (Rome). The writer employs permanent drainage in cases of chronic idiopathic peritonitis where the disease defies all methods of treatment, and the ascites reappears in spite of repeated paracentesis. A long curved trocar is introduced through the abdominal walls into the peritoneal cavity on one side and thrust through and out on the other. A drainage tube is then inserted, the openings closed with glass stoppers and the strictest antisepsis observed. During the first few weeks the fluid is drawn off once in twenty four hours, and in a case of the author it varied in amount from 500 to 1,000 grammes; then every two, every three days, and, finally, once a week. Gradual improvement usually takes place under this treatment. The writer cites a case in which treatment began in May, 1888, to end with recovery in March, 1889. —*Riforma Medicale*, No. 1526, p. 838.

A. PICK (Boston).

V. Cholecystotomy for Gall-Stones, Performed on the Strength of Symptoms without Physical Signs. By A. W. M. ROBSON, F.R.C.S. (Leeds). The author has performed cholecystotomy twenty-three times without a death. He has heretofore reported five cases in which he operated on the strength of the symptoms alone and he now adds two more, as follows: (1) A man, æt. 29, had been well up to a year previously when he was seized while at work with a sudden attack of pain on the right side of the abdomen just below the ribs. Since that time these attacks had recurred at irregular intervals, but at no time had he been jaundiced nor had any swelling in the hepatic region; his stools had never been clay colored nor had his urine been specially dark. His last attack persisted six hours. The gall-bladder, rather small, was exposed lying well under cover of the liver. It contained one gall-stone lying loose while five others were crowded into the cystic duct from which they were removed by means of forceps

within aided by fingers without. The gall bladder was so far from the surface that the lower edge of the incision could not be brought to the parietal peritoneum, and the omentum was utilized to shut out the general peritoneal cavity by bringing up its right border, stitching it to the incision in the gall-bladder and then to the parietal peritoneum. A drainage tube was inserted into the gall-bladder and bile began to flow immediately after the completion of the operation. The drainage tube and sutures were removed in a week and the wound was completely healed a month later. (2) A man, æt. 50, presented a history of re peated accessions of pain in the liver at irregular intervals during the preceding year; he had been jaundiced but once, the color in the eyes then only lasting three days. Careful examination of the motions dis covered no gall-stones and while it was thought that there was a slight swelling on the right side of the abdomen, it was not positive. Chole- cystotomy discovered one gall-stone about the size of a cherry and without any facets. Bile flowed at once, the drain was removed on the third day and the stitches on the eighth, while the patient was cured in three weeks.

The author believes that unless gall-stones are small and can be passed, they tend to increase in number and may ultimately lead to most serious complications, such as exhaustion from repeated attacks of pain, fatal collapse from acute agony, fatal jaundice, dropsy and empyema of the gall-bladder, abscess of the liver, local peritonitis and perforation with all its sequelæ. Believing also that by far the greater number of patients who are suffering from repeated attacks of so-called spasms are in reality suffering from gall-stones, and that the operation for their removal offers but little danger, he recommends operation in all such cases which do no not yield to a definite course, not necessarily very prolonged, of medical treatment.—*London Lancet,* Jan. 10, 1891.

VI. Gastrotomy for Ingested Foreign Body. By D. Low- son, M.D.(Hull). An insane man æt. 37 complained of pain in the left side where four days after admission to hospital a small nodular prominence appeared under the seventh costal cartilage; it was painful to the touch and disappeared with a jerk on slight pressure; there was

neither redness nor discoloration at this time, but later it became gradually more prominent and diffuse, redness appeared about it and an abscess seemed to be forming. There was neither sickness, vomiting nor any other symptom specially pointing to the stomach except perhaps an aversion to food. Poultices were applied and a week later a small opening appeared in the center with apparently gangrenous underlying tissue; and the next morning, projecting from this opening, was found an iron wire resembling a knitting needle about six inches long, which could be pulled out to a certain point but no further. The absence of pleurisy and peritonits showed that, whatever the body was, sufficient adhesive inflammation had been set up by its passage through the wall of the stomach and other structures to prevent the escape of the contents of the stomach into the abdominal or thoracic cavities. Having decided not to remove the body by enlarging the existing opening, the stomach was reached through an incision parallel to the left margin of the substernal triangle, it was opened by a cut an inch long. The finger, introduced here; felt the rod and attached to it something like a handle; when removed, the body was found to be a skewer 7½ inches long with an oval eye through which passed a pragment of a clay pipe 2½ inches in length; one end of the pipe had been broken off close to the bowl and was thus a little larger than the rest of the stem, which prevented its slipping through the eye of the skewer. The stomach wound was stitched with Lembert's suture and the abdominal wound closed in the usual way. The patient made an excellent recovery, being fed entirely by the rectum for nine days, and after the eleventh day with liquid food by the mouth, solid food being permitted on the twentieth. The mental condition of the patient has rendered it impossible to discover when the bodies were swallowed or how he got them down.—*London Lancet,* Jan. 31, 1891.

JAMES E. PILCHER (U. S. Army).

VII. Case of Cancer of the Stomach in a Youthful Individual. By DR. H. KOSTER, (Upsala, Sweden). The writer describes the following case: A young servant girl æt. 23, without any hereditary predisposition to cancer, began a year before to suffer from diges-

tive disturbances, headache and pain in the præcardiac region. Her menses became frequent, profuse and irregular and she presented a general anæmic appearance. As the disease progressed vomiting of more or less undigested remains of food mixed with a black, acid fluid set in. At her entrance into the hospital her skin and mucous membranes were pallid; hands and feet cold; pulse small and weak. Appetite bad and the patient complained of a continuous boring pain in the epigastrium, not worse after meals but especially worse at night. Abdomen was not distended, but tympanitic on percussion; no resistance anywhere palpable, but the epigastrium in general was sensitive to pressure. The vomiting became worse; a small and circumscribed spot four centimetres above and one centimetre to the left of the median line finally could be outlined as the point of greatest sensitiveness. This spot developed into a round resistant point of about the size of a fifty cent piece. It pulsated quite strongly under the finger and synchronously with the radial pulse. On percussion it gave forth a somewhat dull sound which could not be clearly marked out from its surroundings. A trial incision was made, and, as an inoperable tumor was discovered, the wound was closed. The patient died the following day.

The necropsy revealed a cancerous infiltration of the pyloric end of the stomach; anteriorly an aperture of about four centimetres diameter led partly into the stomach and partly into a hole filled with gangrenous and putrid masses. The mucous membrane of that portion of the stomach was thickened and gangrenous. Portions of the posterior pyloric wall were also destroyed. The author has already reported a similar case. (Upsala. Lakarforen. Forh. Bd. XXIII, H. 4 and 5).— *Upsala Lakareforen. Forh.*, Bd. XXV, H. 9.

VIII. Mikulicz' Operation in Cicatricial Stenosis of the Pylorus. By DR POSTEMPSKI (Rome). At the session of January 25, 1891, Dr. Postempski presented to the Royal Medical Academy, of Rome, the stomach of an individual upon whom Mikulicz' operation for cicatricial stenosis of the pylorus had been performed. The stenosis had been the result of cicatricial contraction from ulcer-

ous pyloritis following the ingestion of nitric acid.   The operation was done, the patient recovered, but contracted pulmonary tuberculosis and died.   In the specimen the pylorus was dilated and permitted the passage of two fingers.   Besides the pyloric there was also an œsophageal stenosis just above the cardiac end of the stomach.   This latter was treated by means of olive-tipped bougies, yet, during the last months of life it reproduced itself, and although nothing but liquids were swallowed and digested the pylorus remained pervious. Therefore, the speaker would regard this anatomical specimen as a ' proof of the two means of dilatation in cicatricial stenosis of the py· lorus of the same origin.— *Gazzetta degli Ospitali.* No. 10, p. 78, 1891.

IV.   Plastic Surgery of the Stomach.   An Experimental Study.   By PROFESSOR GIVSEPPI BONANNA (Surgical Institute at Rome).   The many surgical operations which have been performed on the stomach with excellent results, the exact knowledge of its physiological functions which we possess to day, and the possibility and necessity which may, in extensive destruction of the walls of the stomach, arise to lead one to perform a plastic operation on this organ have induced the author to carry out his experiment.   Among the cases where resection with subsequent plastic repair might be required he does not include diffuse cancer of the stomach, but mentions sarcoma, which is often circumscript and solitary, and many other processes. He considers, at length, the physiology of the stomach and states that one must not be afraid that in resecting large portions of the walls of the stomach and replacing them by plastic surgery, too many of the peptic glands are removed so as to interfere seriously with digestion. The action of the pepsine is not, as the experiments of Wurtz and Hoppe Seyler have shown, the most important factor in the process of digestion, but that of the hydrochloric acid.   Moreover, there is in regard to the action of pepsine a complementary action of pancreas ; as concerns the hydrochloric acid, this is supplied in other ways.

These physiological facts have led the author to think that in extensive destruction of the walls of the stomach the loss of substance

may successfully be replaced by plastic repair. This would, however, not give to the stomach its primary capacity, but the results would be far superior to those if the two edges of the injured stomach would only be united by means of a single suture. It was necessary to find a tissue, which would respond to the following essential requirements :

1. That the graft to be used should not by its anatomical properties present any difficulties, in the applications of sutures between the walls and that of the stomach.

2. It should supply sufficient surface to give the largest possible amplitude to the stomach.

3. It should possess a superficial epithelium, so as not to be attacked by the gastric juices.

4. It should afford a broad pedicle to furnish the necessary blood supply to warrant the vitality of the transplanted section.

The transverse colon seemed to answer all these puposes. The experiment was performed on a dog.

Experiment.—On Feb. 15, 1890, after the animal had been prepared properly for a gastrotomy, all antiseptic precautions having been taken, the author made an oblique incision on the left side through the abdominal wall, running parallel for a few centimetres with the edges of the ribs and externally to the ensiform process of the sternum. The peritoneum was cut through, the stomach searched for and lifted out of the abdominal cavity. The entire anterior wall, including the greater curvature, was then removed by means of the scissors. After the hæmorrhage had been partly controlled by ligatures, the remaining mucous surface was disinfected by a tepid solution of boric acid and the remainder of the cavity filled out with antiseptic gauze, this forming the first part of the operation. The stomach being covered with a piece of warm cloth, one proceeded to the second step of the operation.

The transverse colon was now searched for and easily found. It was lifted up into the abdominal wound and, to prevent the escape of fæcal matter on being incised, a section of it was ligated off by two elastic tubes and the part of intestine between the ligatures resected. The necessary portion of the mesentery was also dissected out, **care**

being taken to avoid the cutting of the vessels. Those of the latter which had to be cut were compressed by two ligatures immediately after having been severed. The whole resected tissue had now the shape of a triangle. The piece of resected intestine was divided longitudinally and its inner surface disinfected with a 3% boric acid solution. Meanwhile the opened intestine had somewhat shrunken in length and breadth, which circumstance is to be taken into consideration, although the secondary contraction was inconsiderable in this case.

The third step of the operation comprised the following: Uniting the resected portion of intestine to the edges of the posterior walls of the stomach by means of sutures, and joining of the ascending colon to the descending, thus re-establishing the continuity of the large intestines. The portion of mesentery which was intended to furnish nutrition for the resected piece of intestine remained isolated, except at the common point of attachment. The suture used in this operation was that adopted some time ago by Prof. Durante (Naples), consisting in three layers of sutures, of which two are continuous, joining the muscular coat to the muscular, the muscular and serous to the muscular and serous, and, finally, a separate catgut suture applied to the serous coat for the sake of security. To have the mucous layer not included in the suture is of utmost importance, as by its tendency to protrude it joins the mucous membrane of the other side at the line of the incision, thus forming an elevation preventing, immediately after the operation, the passing through of septic material.

The auther operated, a few days after, upon another dog, which, however, died on the third day after the operation. At the necropsy it was found that a part of the suture of the colon had given way, on account of the rapid absorption of the catgut (No. 1). The sutures of the stomach were perfectly intact. The piece of intestine which was used in the plastic repair of the stomach showed no signs of softening and its mucous layer was perfectly healthy.

The first dog bore the operation well. He received twelve hours after the operation milk, and on the fifteenth day he could already digest bones without difficulty. He never vomited the ingested sub-

stances. He was killed at the end of March. To determine the diges-
tive power of the stomach the dog was fed half an hour before death
with bones. The contents of the stomach were given to Prof. Maggini
for examination. His conclusions, after a very careful examination,
the details of which are given in the original, were as follows: "The
liquid contained a nearly normal amount of gastric juice, and I dare
say that the precipitate of pepsine which was attained by treating it
with bichoride of mercury, acetate of lead and alcohol corresponds
nearly to the normal There was no precipitate on boiling, treating
with ferro-cyanide of potassium, perchlor of iron, etc." Examination
of the abdominal cavity and viscera revealed vast adhesions of the
great omentum to the anterior surface of the stomach, and of the line
of suture of the stomach to the small intestine. The pancreas was en-
larged. Otherwise the structures were not found to have undergone
any histological change. After this excellent surgical and physiological
success, the digestion and assimilation being hardly disturbed, the
author does not hesitate to recommend this plastic operation in great
loss of substance of the stomach. (*Gazzetta Medica de Roma*, XVI,
fasc. 16, p. 377, 1890).

F. H. PRITCHARD (Boston).

REVIEWS OF BOOKS

A CLINICAL TEXT-BOOK OF MEDICAL DIAGNOSIS for Physicians and
Students, Based on the Most Recent Methods of Examination. By
OSWALD VIERORDT, M.D., Professor of Medicine at the University
of Heidelberg. Translated from the Second Improved and En-
larged German Edition, wth Additions, by Francis H. Stuart, A M.,
M.D., of Brooklyn. With One Hundred and Seventy-Eight Illus-
trations. Philadelphia: W. B. Saunders. 1891. St. Louis: J. H.
Chambers & Co.

MEDICAL DIAGNOSIS with Special Reference to Practical Medicine. A
Guide to the Knowledge and Discrimination of Diseases. By J. M.
DA COSTA, M.D., LL. D., Professor of Practice of Medicine and of
Clinical Medicine at the Jefferson Medical College, Philadelphia.
Illustrated with Engravings on Wood. Seventh Edition, Revised.
Philadelphia: J. B. Lippincott Company. 1890. St. Louis: J. H.
Chambers & Co.

The work of Dr. Vierordt is a well arranged volume of 700 pages.
It is devoted especially to the methods of examination of the various
organs and systems of the human body. The chapters have such
headings as "Examination of the Circulatory Apparatus," "Examination
of the Digestive Apparatus," "Examination of the Nervous System."
Under each chapter are the numerous subdivisions. Pains is taken to
emphasize the fact, that, besides the use of instruments of precision
and finer methods of diagnosis, the unaided senses, especially the eye,
must not be forgotten. Means of diagnosis without the aid of the
microscope and reagents are dwelt upon, yet the matters of finer diag-
nosis are not ignored. The most approved tests are given for the de-
tection of the various pathognomonic bacteria.

A conspicuous feature of the work is that many of the statements lack pertinence. The author tells us certain things are so, or that certain conditions may exist, without stating to what these signs point, or without drawing any conclusions therefrom. These observations are frequently made concerning well-known facts, so that they seem quite superfluous

Praise is due to Dr. Stuart for the excellent translation which he has made, and for the valuable notes and comments with which he has interspersed the work. The elaborate index, which comprises a reference to every statement of importance, contributes to increase the value of the book. The author, in his preface to the English edition, expresses his thanks to Dr. Stuart for the translation.

The volume is well illustrated. Many of the plates are colored, and are very beautiful.

Dr. Da Costa's work, which has been translated into Russian, French and German, of which a second German edition has recently been issued, and which now appears thoroughly revised in its seventh American edition, needs no introduction to the medical profession. The methods of classification and arrangement differ materially from the German work. The physical signs are treated of under the heads of the various diseases, under which are given the diagnostic symptoms of the disease, special attention being paid to the differential diagnostic points. The system of parallel comparison of symptoms of diseases which simulate one another is made use of to a considerable extent. Under such headings as "Acute Affections in which Delirium is a Prominent Symptom," "Disorders in which Little or no Urine is Discharged," "General Abdominal Enlargement," "Partial Abdominal Enlargement," etc., are given clearly the chief diagnostic features of the various diseases which come under these heads. The remarks on "Diseases Attended with Tenderness and Pain in the Right Iliac Fossa" are surgically sound, excepting, perhaps, a too free use of the terms "typhlitis" and "perityphlitis."

It is evident that the author of this work has had a broader experience in the field of medical diagnosis than has the author of the German work. The former has produced a book containing a much

larger amount of practical information.   He tells us not only of symp-
toms, but to what the symptoms point.   He describes the morbid
manifestations which may be observed in connection with the different
organs, and tells what pathological states these signs indicate.   The
first dwells more on diseases; the latter on symptoms.

Dr. Da Costa's work contains a section on the diagnosis of skin dis-
eases which the other does not.   Hæmoptysis is fully considered by
him, whereas the recent work gives this important sign but little space.
The surgical diseases are fairly handled; the differential diagnosis of
thoracic aneurism is deserving ot the highest notice.   But to mention
the chapters especially noteworthy would be to produce a list quite
identical with the table of contents.   JAMES P. WARBASSE.

ON THE TREATMENT OF TRAUMATIC ANEURISMS, WITH REPORT OF A CURED CASE OF TRAUMATIC ANEURISM OF THE RIGHT COMMON CAROTID ARTERY.

By DR. MATLAKOWSKI,

OF WARSAW.

C ASE. On April 21, 1887, Pauline Chruscikowska, æt. 41, came to my department, sent by a doctor from Volhynia. The woman was very feeble and pale, with suffering imprinted on her countenance, and thus described the beginning of her illness: About two years ago she noticed that the right half of her neck was rather thicker than the left. In the parts below the angle of the jaw she could, on palpation, feel a tumor as large as a plum, which gradually enlarged and had this year attained the size of a hen's egg, without, however, causing any pain. This tumor did not alter as to size, but the patient imagined that it appeared rather larger of a morning, or after she had been walking more than usually in the course of the day. It was not very deeply situated; could be grasped between the fingers anterorily. Under pressure it receded. The patient felt no pulsation during this examination. The constant growth of the tumor and frequent nausea induced her to seek medical advice. Four weeks previous she went to a doctor, who first punctured the tumor with a glass syringe, (probably that of Pravaz) and then (it may be that the needle had not reached the tumor), made an incision with a knife and introducing the same syringe into the wound, drew off from the tumor, 15 syringefuls of a transparent light yellow fluid. He then injected into the cavity a yellow solution (probably iodine or perchloride of iron), dressed the wound and sent away the patient to her home, several miles away.[1]

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[1]As I see from the letter of my colleague, the injected fluid was a 10% solution of zincum muriaticum. Dr. R. says distinctly that he had to do with a cystis colloidea, and injected the fluid for the purpose of bringing about adhesive inflammation.

While yet on her way she experienced a feeling of numbness at the nape of the neck, and a slight pinching in the parts round the late tumor. On the next day the pain increased and fever set in, so that she was confined to bed for four days. On the eighth day after the above-mentioned puncture, the patient, tired with her day's work, suddenly felt a violent tearing pain and pulsation in the neck. Wishing to relieve the pain she took off the bandage and then remarked a much larger tumor, which not only filled the place of the former one, but descended lower on the neck. Another doctor being summoned, supposing that inflammation had set in, punctured the tumor with a syringe and drew off pure blood; he remarked that it had not yet come to suppuration and advised compresses. As the pains and the tumor continued to increase, while the patient at times had the sensation as if something in her neck had suddenly burst, accompanied by violent pain and enlarging of the tumor, which at the same time became uneven (irregular on the surface), a consultation was arranged.

During this consultation the tumor was punctured with a knife, but instantly the blood gushed out, so that the wound had to be sutured as quickly as possible and covered with hæmostatic cotton-wool, the tumor was covered with cotton-wool saturated with collodion, and thus a shield was formed, which adhered rigidly to the skin and restrained the growth of the tumor. The patient was then sent to Warsaw. The tumor now enlarged, not daily, but hourly; at times there was a pain as of tearing and bursting in the neck, besides retraction of the tongue and piercing pain in the right half of the head and nape of the neck.

On April 22, after removing the shell of cotton-wool and collodion, we found as follows: The patient can only with difficulty change her position from sitting to lying and *vice versa*; to restrain the pain she often catches on her head, supporting it with her hands. The head is turned with the face to the left and slightly bent downward. The whole part on the right side of the neck is occupied by a very prominent tumor along the sterno-mastoid muscle, extending from the mastoideus process and the jaw nearly to the right clavicle, which, however it does not reach, being separated from it by a free space of the width of a finger. At the back, the tumor reaches the line drawn from the mastoid process to the middle of the clavicle, and at the front it almost reaches the center line of the neck, displacing the larynx and the trachea toward the left. The skin on the tumor is partly pink, in some places the epidermis is raised in blisters (bullæ) or even desquamating under the influence of the collodion or some other irritant, and

in some places there may be seen shining through, pale blueish marks as of a bruise.˙ At about the apex of the carotid triangle is a horizontal scar of about three-fourths centimeter in length, and lower down, the sutured small wound, closed up by the hæmostatic cotton-wool. On close observation the pulsation of the tumor becomes visible; it may be distinctly felt by the fingers and made more apparent still by the stethoscope, and is simultaneous with the pulse. Taking the tumor between the fingers, it can be felt to pulsate synchronously with the heart. A slight puffing (blowing) bruit murmur which corresponds with the diastole of the arteries can be heard on auscultation. The tumor itself is elastic, especially in the center, which is its most prominent part; it is firmer at its periphery. Its margin is not very distinctly defined. owing to the infiltration of tissues which conceal the borders of the healthy parts; the tumor is not moveable. Under pressure, which from consideration for the patient is not very great, it diminishes but slightly. The examination of the tumor is not painful, with the exception of soreness of the skin, where it has been denuded of epidermis. The veins of the neck, face and temples are not distinct, not dilated (distended). Pulsation in the artero-temporalis on both sides is synchronous, with no difference in force. Pulsation in the radial artery *considerably weaker* than in the left. The patient feels no permanent pain in the head or ringing in the ears. The right fissura palpebrarum is permanently narrower than the left, the eyelid seeming to droop. The pupils are equal in size, but the right expands more indolently than the left. The jaws open only so far as to admit a finger; examination of the pharyngeal cavity, therefore, does not succeed. Deglutition quite easy. respiration not oppressed, voice unchanged, no cough or expectoration. The skin of the face is slightly cyanotic, veined on the nose, cool and damp on the nose and forehead.

The heart tones quite clear and distinct, beating strong, 100 in the minute. Temperature normal. Respiration of the chest vesicular. Further, no considerable changes have been remarked. The tumor was covered with iodoform gauze which was fastened down firmly by strips ot adhesive plaster with the view of making the pressure equal.

After having considered the history and the results of the examination, we arrived at the following conclusions: The patient must have had some kind of cyst in the parts below the jaw, not a congenital cyst, probably situated in the vicinity of the division of the carotid artery. That it was a cyst and not an aneurism was evident from the fact that the doctor after the exploratory puncture, had made an incision and drawn off 15 syringefuls of fluid, then dressed the wound and sent the

patient home.   Most probably, in consequence of the injection of an
irritating fluid into the cavity, which was in immediate connection with
the wall of the artery, and at the same time owing to the diminished
pressure caused by the emptying of the cyst, the wall of the artery
burst and the blood gushed in, first into the cavity of the late cyst,
and from thence breaking through into the tissues, formed an enormous
cavity filled with blood flowing freely from the lumen of the artery to
the tumor, the proof of which was the puffing (blowing) bruit.   In this
manner a traumatic aneurism had been found.

In default of a great many characteristic symptoms: (venous disten-
tion of subcutaneous veins, so called fremissement vibratoire or thrill,
which can be felt by the fingers, the puffing bruit, constant und in
creasing in force, synchronous with the diastole of the artery, (*bruit de
souffle*), venous pulsation and so on, the idea of an arterio-venous
aneurism could with certainty be excluded.

Now came the important question: what was to be done with the
patient? Considering the rapid development of the tumor, the pressing
back and laceration of tissues, the approaching fatal moment of the
bursting of the aneurism, I at once could see only *one* way of deliver-
ance; instead of awaiting the hæmorrhage, rather to avert it in this
manner:to make a rapid, bold and wide incision from the apex to the base
of the tumor, instantly press down with the finger the opening in the
artery, remove the blood and coagulum from the cavity and then liga-
ture the vessel.   I could with terrible clearness see all the danger of
this proceeding, seldom resorted to in connection with the small arteries
of the extremities, but on the other hand there was the inevitable alter-
native of death by hæmorrhage, ignominious in the face of the improve-
ments of our modern surgery.

The state of the patient meanwhile had become much worse during
48 hours; disturbances in deglutition and respiration had set in owing
to the pressure on the trachea and œsophagus, the larynx was pressed
down still further, the jaws so closed that a finger could not be intro
duced into the pharynx, debility great, and the pain and fear of in-
creased pain so great, that the patient entreats not to be touched or
her bandages removed.   On removing the latter we found as follows:

The tumor had enlarged very considerably, the distance from the
attachment of the lobe of the ear to the sternal attachment of the
sterno-cleido-mastoidei muscle being 18 centimeters.   The tumor had
moved mostly downward, reaching the clavicle, so that the ligature of
the common carotid artery of which I had thought as the introduction
to the above mentioned operation had evidently become impossible.

On examining the cavity of the mouth with the finger, one can distinctly feel the floor of it raised at the right side, and one can also see the right arch projecting towards the median line of the body. The skin on the aneurism is more cyanotic than before and feels distinctly cooler than the skin on the left side of the neck, so that the bursting of the sac and gangrene of the skin with all its horrors, seem imminent. The tumor is very much firmer in consequence of the partial filling of the sac with coagulum, but nevertheless the rhythmic motion of the expansion simultaneous with the systole of the heart and the puffing (blowing) bruit, are quite distinct. The colleagues whom I had invited to consultation agreed that the only way was in opening the sac by a bold incision to come to the bottom (fundus) of it, there press down the common carotid artery, and having found the opening in the vessel, which to judge from the position of the cyst ought to be rather high up in the region of the division, there put on the ligature. The preceding ligature of the common carotid artery between the sac and the clavicle of which I had at first thought, had become impossible by the spreading of the aneurism to the clavicle.

On the same day about 12 o'clock with efficient aid. After having put the patient under chloroform, cleansed the neck as thoroughly as possible with soap, ether and solution of sublimate, I made a rapid, long incision from the apex to the base, and having removed a quantity of coagulum with fingers and sponge I introduced a finger into the cavity, at the bottom of which I felt the pulsation of the common carotid artery. I pressed down the latter, but seeing that arterial blood continued to flow from the upper part of the cavity, I on chance, put my finger on the point from which the blood gushed out, pressing it against the vertebræ. After I had in this manner stopped the hæmorrhage, my colleague Tawdyriski made two horizontal incisions, and we then cleansed the walls of the cavity with a sponge and washed it out with solution of sublimate. Now we could see the common carotid artery traversing the bottom of an enormous cavity. I seized the artery just below the compressing fingers with a very powerful forceps used for adhesions of ovarian cysts. As soon however, as I had removed the fingers the blood gushed out again, and again the bleeding vessel had to be seized by another forceps, two other bleeding points quite near being secured by the small forceps of Spencer Wells. In this way we mastered the hæmorrhage and having washed out the cavity, could examine its walls carefully. The exposed common carotid artery evident by its whiteness by its pulsation, traverses the posterior wall of the cavity; the internal jugular vein is not distinguishable. In the

upper part of the bottom of the cavity one can see the bifurcation of
the artery, the actual seat of the hæmorrhage which had been caused
by the sundering of the external carotid artery from the trunk of the
common carotid artery.   There were two other bleeding points, it may
be the thyroidea superior artery and the pharyngea ascendens artery
as those which have their origin nearest the bifurcation.   The further
course of the carotidis in interna et externa artery is concealed by
tissues infiltrated with blood, but they have also no accompanying
veins visible.   Higher up, in the parts near the under jaw, one sees a
dark red bunch, which may be supposed to be the digastric muscle of
the jaw, as also a dark red projection which is the sub-maxillary salivary
gland.   In the parts near the bifurcation, especially inwards from the
carotid externa artery which had been seized by the forceps, one re-
marks a smooth membranous tissue resembling the walls of a sebaceous
cyst after its contents had been scraped out, or the inner membrane of
arteries, which can be easily separated from the deeper parts below it.

This membrane, pieces of which I took for microscopic examination,
probably formed the inner layer of the cyst into which the blood had
broken through and then distended it.   Finally, the inner surface of the
aneurism, especially on the front wall (which had been cut through)
is uneven, divided up by numerous trabeculæ like the interior of the
right heart.   The surface of these trabeculæ, and of the oblong grooves
between them, is smooth, almost glistening.   This surface was covered
by a thick layer of coagulum, which could however be easily removed
by the sponge and fingers.

At about 2 to 3 centimeter's distance from the lesion of the vessel,
I ligatured the common carotid artery with coarse silk, passed in by
the needle of Dechamps, and then removed the forceps which secured
the common carotid artery.   When I now removed the forceps from
the external carotid artery the blood gushed out with as much force
as if the common carotid artery had never been ligatured.   For this
reason the external carotid artery and the internal carotid artery, above
the bifurcation and two other smaller bleeding vessels, were ligatured.
After the most careful washing out of the cavity with a 3% solution of
phenol and 1% solution of sublimate,I sutured the horizontal incision en-
tirely, and the perpendicular from the apex and from the base so as to
leave in the middle a fairly large opening for the discharge of a possible
exudate.   For the same purpose I made a counter opening posteriorly
on the margin of the trapezius muscle.   The dressing consisted of silk
protective, iodoform gauze fastened down by strips of adhesive plaster,
then hygroscopic cotton wool fastened down by a bandage of calico,

and above that a pad of sawdust, which surrounds the nape of the neck part of the side head and the upper part of the chest.

The patient meanwhile had recovered consciousness, and declared all her former pains had ceased, in consequence of which she felt very well notwithstanding the operation which had just taken place.

De cursus morbi.—The next day after the operation we found entire paralysis of the left half of the body, the nose deviating to the right, the corners of the mouth drawn in the same direction, left sulcus naso-labialis and the wrinkles on the left half of the chin smoothed away, the lids of the left eye close well, the right fissura palpebrarum narrow, the eyelid as if swollen, complete anæsthesia and paralysis of the muscles of the left upper and lower extremities, and the left half of the body; the skin and tendon reflexes much stronger; these extremities somewhat swollen.

As to the intelligence of the patient one may say that it has been preserved, but impaired; she does not know that she is paralysed, takes little interest in her surroundings, falls off her pillows and lies with her eyes half-closed. Although she answers questions reasonably enough, she does not realize what has happened, wishes to sit up, to bathe, calls a certain Michael, who is a man-servant in the part of the country from which the patient has come. She drinks willingly, and with great pleasure smokes cigarettes, to which she was habitually addicted; but she easily chokes and begs to be allowed to drink in a sitting posture, in which liquids do certainly much more easily pass down into the stomach.

April 25, evening. Skin warm, warmer than in a healthy person; temperature in the axilla, nevertheless, normal; pulse even much stronger, 130 in the minute.

April 26, morning. Pulse 100, stronger in both radial arteries; general state unchanged; urine had to be drawn off. In the evening, pulse 98.

April 27, morning. Pulse, 96. During the night patient had been quiet; drinks very readily, sitting.

May 1. In the morning patient micturated in bed; complains of pain in the right half of the head, otherwise, lies quietly on her back, with the head turned to the left. Both fissuræ palpebrarum almost equal (while up till this time, the right had been constantly narrower than the left). As to intelligence and consciousness, they are still only partial; the patient answers questions reasonably enough, but almost invariably repeats words; for instance—"does your head ache?" "Aches, aches," and so on. She recognizes persons, but at the same time

takes somebody for a priest, or one person for another, and when she sees both at once does not seem to realize her mistake.   She suffers from constipation—has no decubitus.

It would be both tedious and superfluous to describe the state of the patient day by day, as noted by the hospital cards.   I shall, there-fore, only mention the most important points.

In the first place we, from the very beginning, treated the patient with every possible care and attention; urine was drawn off by the catheter, or if the patient micturated in bed, she was instantly removed to a dry bed; every few days injection of the rectum with warm water was made for the purpose of evacuation, the skin of the back and posterior was rubbed with the hand, diet very carefully attended to; in one word, everything which might prove hurtful was carefully con-sidered and avoided.

As the upper layers of the dressing were often wetted by liquids, spilled in drinking, they were changed as often as necessary, without, however, the deeper layers being touched.   On the seventh day the sutures were removed, the wound found quite healed, with the excep-tion of the opening which had been left, and which was filled with dark red coagulum.   The whole part of the skin which, before the operation, had been bluish, and here and there denuded of epidermis, had now quite come to itself, so that only its yellowy-greenish coloring testified to past ecchymosis of blood.   Toward the end of the second week, the patient became very restless, and tore out pieces of cotton wool from under the bandage.   I, then, for the safety of the wound, put on for a certain time a dressing of gypsum on the neck, nape of the neck, and the parts around the jaw and clavicle, for the purpose of securing the dressing of the wound from the fingers of the patient. In the beginning of the fifth week, the wound was entirely healed, without one drop of pus, or falling out of the ligatures.

About this time the patient began to regain the sense of feeling, and at the end of the sixth week, motion, so that she could with aid, walk up and down the ward.   Our fears of inflammation of the bronchiæ or lungs, in consequence of particles of food getting into the respira-tory ways, proved unfounded; there was also no decubitus.   The temperature of the patient had all this time never exceeeded 37.8° C. On the day on which I reported this remarkable case to the Warsaw Medical Association, June 7, 1887, that is, 44 days after the operation, the state of the patient was as follows:

Face white and full, the head while lying usually turned to the left, and in general, the patient prefers lying on the left side.   The right

fissura palpebrarum wider than the left, especially when speaking or whistling, distinctly paralyzed, the upper extremity also completely paralyzed, fingers bent; can, however, be easily straightened. While lying on her back, the patient can neither lift nor bend her right leg; in trying to bend the extremity passively, in the knee one can feel resistance (contracture) which is easily overcome; the patient can herself straighten the bent leg, during which the hand, holding the skin and resisting the bending, can distinctly feel the action of the straightening muscles. The patient can turn herself in bed, can sit alone, and with aid, walk about the room. Putting out of the tongue is still difficult. There are no disturbances in the respiratory, circulating and digestive organs. The patient feels the desire to micturate, and does so into the chamber pot, and not in her bed. On the neck there is a deep indentation, at the bottom of which one can see a reddish-blue scar. In the lower part of the right common carotid artery one can feel very slight pulsation. If the patient chokes while eating, she sometimes feels a pain in the side of the neck, below the right angle of the jaw and ear. Finally, her intelligence, excepting a certain disposition to sadness, does not seem impaired. She speaks distinctly, answers reasonably, knows that she has a paralyzed arm, reads letters from her family and takes an interest in it; makes reasonable requests (as to a bath, certain articles of food, etc.).

The patient left the hospital on July 14, 1887, with partial paralysis of the upper extremity, but she could, though with some difficulty, walk alone, and move the upper extremity fairly well.

Remarks.

Having finished the description of the case, I now pass on to some remarks upon it, which have been suggested to me by the study of the literature bearing on this subject. I shall chiefly confine myself to aneurisms of carotid arteries, passing over aneurisms of other parts.

1. In the first place, the hemiplegia sinistra, arising within the first twelve hours after the operation, is most worthy of attention. In our case, as the paralysis came on in the night, the state of the patient preceding the appearance of the hemiplegia had not been remarked, it is unknown whether there were convulsions, spasms, etc.—the following morning we only noticed much stronger reflexes of the skin and tendons. Cer-

ebral complications, after ligature of the carotid artery, have
long been known, and have been the subject of many re-
searches, both experimental and clinical.   There is, neverthe-
less, no certain theory explanatory of the various cerebral dis-
turbances, and as our case shows no new features, we pass it
over, only remarking that these disturbances are the most
serious complication subsequent to ligature of the common ca-
rotid artery.   Lefort, after analyzing the various aspects of the
question, thus concludes: "It is remarkable that, even after
excepting cases of ligature of both common carotids, cases
in which disease of the brain existed before the operation, and
finally cases in which the subclavian artery was ligatured, as
well as the carotid, out of 370 cases, 100 cases of cerebral dis-
turbances have been noted, that is, above one-fourth of cases.
Death in consequence of said disturbances took place in 78
cases; which proves that of 370 cases, 78, or one-fifth of
the deaths, were caused by cerebral disturbances.   But this is
not yet all; if we put aside, not to confuse our deductions,
those cases in which both common carotid arteries have been
ligatured, and further, those in which the artery was ligatured
in consequence of nervous symptoms, or to facilitate another
operation, cases, therefore, in which the mortality peculiar to
the operation itself is added to the mortality incidental to lig-
ature, we have yet left 302 cases, in which there are 170 cases
of recovery and 132 cases of death.   The mortality after liga-
ture is, therefore, high—exceeds 43 in 100.   Of the 132 fatal
cases, 73 deaths were caused by cerebral disturbances; so that,
if this powerful cause of failure could be removed, the mortal-
ily would fall from 43% to 19%.   Hence the conclusion: the
frequency of cerebral complications consequent on the closure
of the trunk of the carotid artery is the chief danger attend-
ing ligature of arteria carotis communis[2].   According to
Pilz[3], cerebral symptoms appear in 32% of cases, while Reis,
his continuator, having recorded 73 cases of ligature of arterio
carotis communis in antiseptic times, notes 17 cases of cerebral
symptoms$=23\%$[4]

[2]Dictionnaire enclyclopédique des sciences medicales; art. "carotide."
[3]Lehrbuch der speciellen Chirurgie von Koenig. T. i., p. 506.
[4]Ueber die nach Unterbindung der Arteria carotis communis vorkommende Geh-
irnerscheinungen. Inaugural Dis., Würzburg. Yahresbericht von Virchow und
Thiersch für das Lahr 1885.

Mode of Origin of the Aneurism.

2. One of the most interesting features of the case related is the mode of origin of the aneurism. There is no doubt, after what had been told by the patient and the letter of her doctor to me, that, in the given case, there existed, in the region of the division of the common carotid artery, a cyst, with colloid contents, and that the aneurism arose in consequence of the weakening of the arterial wall, partly under the action of chloride of zinc, in the course of several hours after the operation. The patient had already, on her way home, felt violent pain in the nape of the neck; taking for granted that this pain was in the beginning caused by the action of the solution, the subsequent shooting pains and distension in the neck testify to the bursting of the arterial wall and the overflow of blood. Prof. Kosinski, in conversation with me, expressed the hypothesis that the cyst must have been in the wall itself of the artery, basing his theory on the rapid bursting of the artery. Certainly the rapid action of the solution, which, after all, was not very strong, seems to favor this explanation, although on the other hand, pathological anatomy scarcely admits the existence of cysts in the walls of the arteries. Having this point in view, I extracted from the posterior wall of the aneurism, at about the height of the division, a membrane, which Dr. Przewoski has been kind enough to examine under the microscope. The results of the examination he gives as follows:

"The membrane presented to me for the purpose of examination is of the thickness of 1 to $1^1/_2$mm., hard, very compact, on the inner surface rather smooth, passing into looser tissue on the outside; from the slips taken from different places, it appears that the membrane is everywhere of the same structure; thus, on the outside it consists of extremely compact fibroid connective tissue, which contains few elastic fibres, few fixed cellules of connective tissue, and is slightly infiltrated with cellules resembling migrative cellules. This compact tissue is on the inner surface everywhere considerably infiltrated with red blood corpuscles, and rather more than on the outside, with cellules resembling lymph cells; lastly, the inner

surface of the me.nbrane is covered by a rather thin, hard clot of blood." The examination, therefore, throws no light on the origin of the aneurism. It might be one of the cysts to be found in the neck. Cysts of the neck are divided by Konig in an excellent chapter of his handbook[5] into multi-lobular and uni-lobular. Passing over the first group (the so-called lymphangioma cysticum colli), we find in the second, to which, judging from the descriptions of patient and doctor, the cyst in our case might belong, first, cysts arising from branchial fissures (Kiemenspalten), serous cysts and deep *atheromata*, and bloody cysts (Hæmatocele colli). Most probably this was a cystis serosa arising from branchial fissure; these cysts have three favorite seats in the neck; the parts between the processes mastoideus and the os hyoideum—the parts on the inner margin of the sterno-cleido-mastoidei muscle, and lastly, the fossa supraclavicularis. The cyst in our case was situated in one of the two first-mentioned parts. One might reasonably make the objection that the cyst had made its appearance rather late in life, not until the fortieth year, but it is very probable that it may have been forming long before the patient became aware of it.

In the classification of aneurisms, by Broca, we find the following sub-division: *aneurisme cystogenique*; these are to represent aneurisms arising from a cyst which had originated in the thickness of the wall of the vessel and then come into communication with the lumen of the artery. Holmes[6], who mentions this, adds at the same time that this species has not been acknowledged in any other classification. In none of the works to which I have had access have I found any mention of aneurisms arising from cysts, while there are cases known of an aneurism being formed by the opening of an abscess into the lumen of an artery, with the walls of which it was directly connected. Liston's case of this kind is well known, and Lefort[7] mentions several other ones referring to the arteria carotis communis and the carotis internal. Holmes[8] mentions

[5]Lehrbuch der speciellen Chirurgie, 1885. iii. T., p. 539.
[6]L. c., p. 412.
[7]Article "Carotide," l. c., p. 675.
[8]L. c., p. 421.

that Dixon has described an interesting case of hæmorrhage of the subclavian artery, which had arisen in consequence of the suppuration of the wall of a hydatid cyst which had been incised. All this, however, has no reference to the matter engaging our attention.

In a chapter on this subject, Broca[9] says: Stenzel and then Corvisart first drew attention to the existence of cysts, contained in the thickness of arterial walls; Leudet presented a curious specimen of a spleen in which there were three cysts: one not communicating with the artery, the other opening into it by two small apertures, the third, lastly, connected with the artery by an opening which equalled the diameter of the aneurism itself. Aneurisms caused by cysts should therefore arise in this manner: the cyst with its compact, hard, as if cartilaginous or encrustated walls, containing a fatty or atheromatous mass, arises in the thickness of the arterial wall and spreads in it in the shape of a semicircular tumor, always of inconsiderable dimensions, varying according to the size of the artery which has been attacked. Such a cyst may open into the lumen of the artery in this manner: first, there arises a hair-like opening, which gradually widens till, at last, the wall separating the lumen of the artery from the cavity of the cyst disappears altogether. The above explanation has not been received without serious objections. Already Hodgson (1819) justly remarks that some aneurisms, healed by the deposit of coagulum on the walls, with preservation of the lumen of the vessel, may give rise to tumors simulating the above-mentioned arterial cysts; in his opinion one must in this manner explain the facts recorded by Corvisart; according to him, therefore, arterial cysts, instead of being the starting point of aneurisms, are rather their consequence. After all this Broca concludes that arterial cysts are most frequently healed aneurisms, but that there are cases, although not numerous, which indicate that there may be original cysts which may subsequently open into the vessel and become the starting point of a very rare kind of aneurism. Eppinger, in his extensive monograph,

[9] Des aneurysmes, p. 11.

does not with a single word mention this cause of aneurism.[10] Our observations seem to give every reason to suppose that the cyst became the starting point of the aneurism, but we must admit that we can not make this affirmation with desirable certainty.

The method adopted by me, although it may be classed among the old methods, differs in an essential point from the so-called Method of Antyllus[11] (old operation, *méthode ancienne*), which consists in this: That ligatures.are passed in under the artery from both sides of the aneurism, the vessel ligatured and then the sac opened.

Modern authors mention a modification of this kind; instead of ligating the artery, pressure is exercised between the aneurism and the heart on the trunk which conducts the blood into the sac, by means of the finger tourniquet, or best of all when it is possible the bandage of Esmarch. The sac is then opened, the coagulum scraped out, the opening for ingress and egress of the sac into the artery is sought for, ligatured, and the wound healed. (Lefort, p. 570; Follin-Duplay, p. 317; T. Holmes, p. 456.) This method of operation was generally applied to the smaller arteries, and all aneurisms, excepting those of the neck, groin and axilla. Although this method may from its description seem very simple, in practice it is indescribably difficult, in cases where the aneurism is deeply situated, or when the artery joins the sac from the deep side, or when the sac has many convexities.

Besides the difficulties in the performance, this operation, in pre-Listerian and especially in more distant times, belonged to the most serious, for this reason, that there often remained an enormous cavity in which suppuration took place and often spread, leading to thrombosis of the veins, to phlegmon, to subsequent hæmorrhages, to pyæmia, etc.

[10]Pathogenesis de Aneurysmen einschliesslich des Aneurysmen equi verminosum. Archiv für klin. Chir. T., xxxv.

[11]Generally, in the Handbooks it is called the Method of Antyllus, although as Lefort justly remarks, there is not the slightest proof that the Greek had first invented it, as his works have not come down to us; only in the work of Oribasius, discovered in Rome, 1831, by Angelo Mai, there is a chapter which contains the most distant traces of this operation, but Antyllus may have taken it from other still more ancient works of his predecessors, which have been lost.

The necessity of being secure from hæmorrhage during the operation, either by means of ligature or pressure of the artery between the aneurism and the heart, seemed to exclude from the old method all aneurisms of the carotid, subclavian, and iliac arteries, and even those of the femoral artery which are situated at its origin. And, really, how could one have the courage to open the sac at the risk of the patient dying of hæmorrhage under the eyes of the operator, when there were no means of averting the hæmorrhage?

O. Weber (p. 205), in his remarks on the various methods, considers that of Antyllus the most dangerous, and says that, owing to the suppurations of the sac, aneurisms on the neck, parts near the groin, and in the axilla, should not be operated at all, according to this method. Broca[12] mentions a certain Morel, surgeon of the Charité in Paris, who, at the close of the 17th century, endeavored in this manner to cure an aneurism of the carotid artery; the patient died of hæmorrhage during the operation. And so, this operation, which even formerly, was in general extremely rare, has fallen into complete disuse, since the memorable operation of ligature of the artery above the aneurism, performed in 1785, by the great Hunter, whose name it now bears.[13]

What, however, can a surgeon do, if, beside the aneurism, either of the axilla or groin, and especially the neck, there is no room either for pressure or ligature, while death from gangrene of the sac and skin, with subsequent hæmorrhage, threatens the patient? Is he passively to await the decease of his patient, since none of the methods of curing aneurisms (pressure, electro-puncture, etc.), can be put into practice, and, as in our case, owing to the spreading of the tumor to the processus mastoideus and the jaw, even the method of Brasdor-

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[12]Des aneurysmes, p. 214.

[13]In manuals and periodicals, especially French ones, this method is often called the Method of Anel or Anel-Hunter. Not to speak of the articles of Englishmen, such as Hart and Holmes, who might be suspected of being biassed, it is enough to read the interesting, exhaustive and highly critical work of Lefort to see the services of Anel reduced to those of ordinary observation without consequences; all the honor is due to Hunter, who gave a new impulse to the operation; it was only then that literary researches brought to light the long-forgotten Anel.

Wardrop becomes impossible? I think that to this question
the answer must be in the negative, especially now, when an-
tiseptic treatment allows us to attain in surgery almost the im-
possible.

But even in former times there was found in the nation
which has produced Abernethy, Pott, the Coopers, the Hunt-
ers, Bell, Brodie, Liston, Fergusson, Lister, Spencer Wells,
and many others, a surgeon, Syme, who had recourse to the
operation of opening the aneurism, with subsequent ligature
of the arteries, and was fortunate enough to save the life of his
patient. These cases belong to the greatest *curiosa* of surgery,
and in support of my observations, I take the liberty of de-
scribing them.

OBSERVATION 1.—David Craik had a traumatic aneurism on the
left carotid artery, which had arisen seven weeks previous, in conse-
quence of the stab of a dagger, in the neck. This aneurism increased
rapidly, notwithstanding the exercise of pressure   Although the tu-
mor was of the size of an orange and did not reach the clavicle, Syme
did not consider it easy or even possible to find the artery, in order to
ligature it after the method of Hunter. He, therefore, first made a
small opening in the sac with a knife, passed in a finger which ob-
structed the opening which had been made, then, with the tip of
the finger he felt until he had found the point, the pressure of which
caused the pulsation to cease. He then pressed on this point with
great force, laid open the sac and sponged out the coagulum. A
smooth, serous surface, without the vestage of an artery or vein, now
became apparent. Having cut through the skin and the external part
of sternocleido-mastoidei muscle horizontally, he seized the opening
through which the blood escaped, and which was pressed by the finger,
with forceps, drew the vessel out toward the trachea, scraped it care-
fully with a knife, so that the wall of the artery could be seen distinctly,
then ligatured it above the opening; in the same manner he passed in
a ligature below and then could remove the finger without fear of hæm-
orrhage. The patient recovered. (Holmes, p. 580).

In 1860 Syme announced a second case cured in the same manner.
This time it was aneurism of the axillary artery ; the state of the pa-
tient was alarming owing to threatening gangrene, so that, at first, ex-
articulation of the shoulder joint was spoken of. Syme, however, fear-
ing great hæmorrhage, preferred to have recourse to the old method.

He thus describes the operation: After putting the patient under chloroform, I made an incision along the outer margin of the sterno-cleido-mastoidei muscle through the skin, platysma myoides and fascia, so that one could pass in a finger to the point where the subclavian artery appears from below the scalenus anticus muscle and lies on the first rib. Syme then opened the sack, but the violent gush of blood indicated that the artery had not been well pressed. While I obstructed the opening with the hand, Lister, who was assisting me, managed to master the artery by an inconsiderable motion of the finger, which he had passed in deep under the upper end of the tumor and through the coagulum which it contained. I then opened the cavity and with both hands scraped out nearly seven pounds of coagulated blood (this has been verified by weight). It now became evident that the axillary artery had been torn horizontally; as blood continued to escape from the inferior end, I first of all ligatured that, then I cut through the pectoralis minor muscle to the very clavicle, and holding the superior end of the artery between the fingers and thumb, I passed in an aneurism needle about half an inch above the opening of the artery, and ligatured it " (Holmes, p. 555). In this case the extraordinary ascent of the clavicle, caused by the great overflow of blood in the axilla, on one hand facilitated the getting at and ligaturing the artery from below, and on the other hand, made it so difficult of access from above. Owing to the great depth in which the third part of the subclavian artery was situated, it became necessary to make an incision through the deep fascia of the neck before efficient pressure of the vessel could be effected. The patient recovered in the course of six weeks. On the strength of this case, Syme endeavored to prove that in treatment of aneurisms of the axilla, the preference is, in general, if not always, to be accorded to the old method rather than that of Hunter. Follin and Duplay share the same opinion, especially as to traumatic aneurisms of the axilla, in which inflammation of the sac is to be feared, and in which after ligature of the subclavian artery there remains a large sac which is disposed to suppurate.

It is difficult to believe, say Follin and Duplay, that the old method could be applied in cases of iliac aneurisms, and, yet, Syme by this method attained the cure of an enormous aneurism of that part. This aneurism spread downward below Poupart's ligament; upward, above the umbilicus; to the right, two inches beyond the linea alba, and in front it projected as much as the crista ossis ilei. The patient was a sailor, æt. 31, and the aneurism had probably formed in consequence of a knock in the groin in Nov., 1861. On April 20, 1862, Syme, after

having put the patient under chloroform, first tried to find the communi
iliac artery, and not having succeeded in this, applied the screw-clamp
to the abdominal aorta, in order to avert hæmorrhage. Having con-
vinced himself that circulation had been stopped absolutely, he made
an incision through all the tissues, opened up the s·c entirely and re
moved about six pounds of blood and coagulum.   The artery joined
the sac at the very apex, having been lifted up by the blood amassed
beneath it.   He then with the utmost accuracy sought out the open-
ing of the artery into the sac and ligatured the artery above and below
the opening.   After the ligatures had been put on it was remarked
that the blood continued to escape fron the opening, though with di-
minished force.   From which Syme inferred that the iliac internal ar-
tery originated in the space between the two ligatures. He, theretore,
uncovered the internal iliac artery and ligatured it.   Thus, the com-
munis iliac artery, the external iliac artery and the internal artery were
each ligatured in turn.   On the 19th, the ligatures came away, the
cavity gradually filled, and the patient recovered.   (p. 469)

Having described this case, Lefort adds: "L'exemple de Syme ne
saurait etre suivi.   L'illustre operateur, dont l'habilete egale la
hardiesse, a ete heureux dans ses tentatives; mais ce qui est permis a
de chirurgiens d'une addresse operatoire at d'une experience absolu-
ment exceptionelles, ne saurait etre conseille comme regle generale,
alors qu'une hesitation de quelques secondes peut amener la mort de
l'opere sous les yeux et entre les mains d'un chirurgien trop confant en
son habilete." (p. 574). Holmes thus expresses himself: "It is clear
that such an operation as this can be successfully performed; (that is
to say, performed without instant death resulting) only by a surgeon
who possesses a large share of the fertility of resource and dexterity
in operating, which Mr. Syme showed in so great a degree in this case."
(p. 580).

As regards the two last cases in particular, Syme was more fortunate
than I in this respect that he could, during the operation, effect pres-
sure on the artery above the aneurism, and besides, he had the choice
between the method which he adopted and that of Brasdor-Wardrop,
while in my case, the want of room made it impossible to ligature the
artery below the tumor (on the distal of the aneurism) or to exercise
pressure above it.

The first who successfully applied the old method to aneurism of
the carotid artery, was, according to Lefort, Sisco, who in 1829 per-
formed the operation on a patient, æt. 17, Fransesco Nasoni; the an-
eurism had arisen in consequence of a stab in the neck with a knife,

several days prior to the operation. Owing to the want of particulars we can draw no conclusions from this case.

OBSERVATION 3.—In 1829, a surgeon of Leeds, who does not give his name in full, only the initial H, published another case [14] "John Pratt, æt. 43, residing near Bradford, was admitted under Mr. H., on March 13, for an aneurism, the result of a wound inflicted on himself by a sharp pointed shoemaker's knife. The injury had been done 10 weeks before his admission: lost at the time a large quantity of blood which ceased to flow as soon as syncope supervened. He gradually rallied and a pulsating tumor made its appearance, situated over the carotid artery, opposite the space between the os hyoides and the thyroid cartilage. The tumor represents a cone (*e. g.*, the tranverse section of a common egg) the base of which may be said to include the artery, and the apex to point outward, on which is a small granulating wound, filled with coagulum. Hæmorrhage to on alarming extent has taken place every ten days or fortnight, but has always ceased on the occurrence of syncope. The above account was given by his son who accompanied him on his admission. Countenance pale, makes little or no complaint; indeed, appears in other respects to ail nothing. It was deemed necessary, on consultation, to secure the artery, which was done the following day at 2 o'clock P.M., by Mr. H. In the first place the common carotid was cut down upon and tied with a strong double ligature, in the usual manner, and without any difficulty whatever, the aneurismal tumor being situated so high above as not to interfere with the necessary incision of the operation. No impediment arose from the jugular vein. The next step was to open the sac, which Mr. H. did, by cutting freely from below upward, and removed the coagulum; the wounded artery being then exposed a copious flow of blood took place. This, together with the circumstance of the vessel being deeply situated, and the risk there was of wounding contiguous parts of an important nature, occasioned considerable difficulty and delay in securing the artery.

In opening the upper part of the sac, the superior thyroid branch was divided and immediately tied. Shortly after the punctured wound of the carotid artery was discovered, around which a double ligature was carried, both above and below, by which means a stop was put to all further hæmorrhage. From the size of the vessel (which was somewhat thickened by the adhesion and condensation of the cellular

[14]London Medical Gazette, 1829, vol. 1, p. 821. For the copy of this and another observation from the original in the library of the Medical School in Paris, I am indebted to Mr. S. Labororoski, student of medicine.

membrane), as well as from the situation of the puncture (viz., oppo-
site the upper edge of the thyroid cartilage), it was judged to be the
external carotid that had been wounded about its origin.

The integuments were brought in contact with adhesive plaster, a
flannel roller applied, and the patient removed to bed.

6 P.M. Complained of heat about his head, with pain and heaviness.
Pulse moderate; had a purgative enema and a dose of infus sennæ ap.
administered, and repeated every few hours until free evacuations
were produced. The spirit wash was kept applied to his head, and
nothing, of course, but the mildest diluents allowed.

10 P.M. Had an evacuation by stool, and felt the symptoms re-
lieved. He now commenced taking the effervescing saline draught,
with 10 grains of the nitrate of potash, and by continued application
of cold to his head, and attention to his bowels, all urgent symptoms
went off in a few days. On the fourth day from the operation the lig-
ature from the superior thyroid came away with the dressing; on the
sixth, that from the external carotid in the same manner; and on the
twenty-third that from the common carotid separated of itself. The
dressings were removed on the second day. Wound was quite free of
inflammation, and had in a great measure united by first intention. It
was dressed daily afterwards with adhesive plaster. In the course of
ten days, the middle half was cicatrized, and little remained but the
sore occasioned by the presence of the common carotid ligature.

The discharge from first to last was very little, and inflammation not
more than necessary for carrying on the adhesive process.

The patient was discharged, cured, April 16, being five weeks after
the operation. Johnson Smith, in his article[15] on the carotid artery
mentions that the old method was successfully adopted by the second
Hey, in the shape of a traumatic aneurism of the carotid artery; it is
very possible that this Mr. H., of Leeds, was identical with the second
Hey.

OBSERVATION 4.—During the American war, Weir[16], on September
30, 1862, acted in the same manner as Syme in the case of a diffuse
traumatic aneurism, caused by a shot-wound in the neck; unfortunately
the patient had, besides, sustained some injury to the spine, of which
he died.

[15]Dictionary of Practical Surgery, by various British hospital surgeons, edited by
Christopher Heath, London, 1887, p. 236.

[16]Medical and Surgical History of the War of the Rebellion. First surgical vol-
ume, pp. 456, 457.

September 30, 1862, I was summoned to a consultation in the case of Henry Herman, æt. 23, who, in the battle of Antietam, had been wounded in the right side of the neck, on the level of the superior part of the thyroid cartilage, and the anterior margin of the sterno cleido mastoidei muscle. There was little information to be gained as to the state of the patient prior to his admission to the hospital on September 24. On the 29th, twelve days after the injury had been sustained, slight hæmorrhage suddenly made its appearance. The bleeding was supposed to have been stopped by filling the small opening of the wound with lint, which had been saturated with liquor ferri sesquichloride. After this a pulsating tumor rapidly formed, and spread so violently that on the same day it extended from the jaw to the clavicle, and from the sterno-cleido-mastoidei muscle to the median line. Although the course of the ball was unknown, paralysis of the right leg and partial loss of motion in the right upper extremity supervened. In one hour after the consultation I was informed that the tumor had greatly enlarged, and had begun to press down the trachea toward the left. The skin covering said aneurism was tightly strained, pulsation and rough thrill could be felt on palpation. The stopping of lint was firmly fixed in the wound by coagulated blood. Respiration slow and abnormal, cyanosis of the face, pulse irregular, 65. It was determined to operate. supposing even that the spine were injured, as death from hæmorrhage was inevitable.

Having given accurate instructions to my assistants as to their parts in the operation, I took the lint out of the wound, and instantly widened it so far as to allow of two fingers being passed into the fundus of the cavity. I was fortunate enough to find and press down the opening of the artery, without great difficulty, and this effectually mastered the hæmorrhage which had been very violent, but of short duration. During the whole of this long operation we noticed that the bleeding from the artery was easily averted by very slight pressure. The coagulum was now scraped out and the incision lengthened, downward to the clavicle, and upward to the extent of an inch (the whole incision was; therefore, 3—4 inches long). The tissues being concealed by infiltration of blood, and displacement of parts in consequence of pressure, we experienced considerable difficulty in finding the artery, above and below the opening. It was only after long and repeated efforts that we found the central part of the artery and ligatured it with the aneurism needle of Mott. Meanwhile, the finger which was pressing down the opening of the artery, accidentally slipped off it, and the blood gushed out from the superior part of the

artery for 5 or 6 seconds. After the peripheral end had been ligatured, the hæmorrhage ceased entirely. While the first ligature was being put on, considerable disturbances in the respiratory ways were remarked, leading one to suppose that the nervus vagus had been caught in the ligature.

At the expiration of 10 or 15 minutes respiration became more regular. After six other ligatures had been put on we noticed hemiplegia of the left half of the body, and somnolence The patient was, however, easily restored to consciousness; power of motion was retained only by the right upper extremity; deglutition was not disturbed. The opening in the artery was oval and a quarter of an inch long. The patient lost only eight ounces of blood, very little in so formidable an operation, which had lasted above two hours." From the remainder of the description, I only extract that the patient died on October 1, with symptoms of ever-increasing debility. At the post mortem examination it was found that neither the inner jugular vein nor the nervus vagus had been caught in the ligature. Examination of the artery proved that the ligature had been carried three fourths of an inch above and three eighths of an inch below the wound, but the upper ligature had become rather loosened. The wound in the sheath of the vessels was one-eighth of an inch below the division of the artery; the wall of the artery seemed healthy, with the exception of the parts nearest the wound. The ball had struck the vertebral column from the front on the inferior edge of the sixth cervical vertebra, just inward from the vertebral artery which was unhurt—and had then penetrated into the spine.

OBSERVATION 5.— George E. Frothingham, Professor of Ophthalmology in Michigan, was more fortunate.[17]

On the night of August 16, 1875, H. O., æt. 23, was injured by the explosion of some powder kept in a store, which he and others were attempting to save from burning. At the time of the explosion he was standing in front of the show-window, and together with some of his companions, was thrown several feet toward the center of the street, and was for a moment rendered insensible. I was called to see the patient about an hour after the injury and found him suffering great depression, fainting at the least attempt at a sitting posture. His face was covered by scratches, caused by pieces of glass and other solid particles thrown in every direction by the exploding powder. Among

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[17]A case of traumatic aneurism of right common carotid; operation of opening of the sac; internal jugular vein being wounded is also ligated, recovery.—American Journal of Medical Sciences, October, 1876.

his injuries were two penetrating wounds of the right side of the neck, one near the anterior-inferior angle of the suboccipital triangle, and the other just at the apex of the inferior carotid triangle.

The openings in the integument had the appearance of having been cut by some particles of glass and were between one and two lines in length. The external hæmorrhage had ceased soon after the injury, but a diffuse aneurism had been formed, extending from the angle of the jaw to the clavicle and pressing the trachea slightly to the left, and interfering with deglutition. An examination with a probe showed that the fragment that had entered at the upper opening had glanced upward and probably lodged in the tissue behind the external ear, though it could not then be felt.

The probe could not be made to follow the lower wound. The voice of the patient was reduced to a mere whisper. Rest in the recumbent position was enjoined; the right eye, which had been wounded, was attended to, and the symptoms carefully watched, the attendant being instructed to call me immediately should the tumor in the neck enlarge or the difficulty of swallowing increase. By morning, deglutitition could be performed with less difficulty, and the tumefaction of the neck showed no tendency to increase. I was thus encouraged to pursue the expectant plan, hoping that the main artery was not wounded, but that the effused blood had been poured out from a wound of some of its branches, and a spontaneous cure might be possible. By the fourth day, however, the bruit became more distinct, and indicated very clearly that the artery wounded was the common carotid. From this time until August 31, the tumor became more circumscribed, projecting more just over the point where the artery was wounded, and leaving a slight depression between it and the clavicle. During this interval the weather had been comfortable, and the condition of the patient somewhat improved, he being able to sit up for a few moments without the marked symptoms of syncope that at first prevented this posture. The weather now became warmer, and by Sept. 3, the tumor showed a decided increase in size, and kept steadily enlarging. By the 6th, it became painful, and on the 8th, it was extremely painful, the patient requiring large doses of morphia to procure rest. The tumor now extended from the angle of the jaw to the clavicle, pressing the trachea well over to the left and projecting full two inches beyond the ordinary level of the neck. A slight depression or groove existed between the tumor and the clavicle. The symptoms being thus urgent, I decided to delay no longer, but operated Sept. 9, twenty-three days after the injury. The operation was

commenced at 3 P.M. The patient having been put under the influ-
ence of ether, the sternal and inner half of the clavicular attachment
of the sterno-cleido-mastoid muscle were divided together with skin
and fascia covering it. An incision was then made through the skin
and deep fascia at the lower portion of the neck, just at the inner bor-
der of the sterno-mastoid, and a trusty assistant was directed to com-
press with his thumb the lower portion of the common carotid. In
exercising the necessary pressure, the thumb broke through the thinned
wall of the sac, but was brought immediately upon the artery, com-
pressing completely its lower portion and with the effect to very greatly
lessen the pulsation in the tumor. A narrow incision was now made
through the most prominent portion of the tumor, the forefinger of the
left hand plunged in, and the wound in the artery looked for. After
a little search this was found and compression exercised, so as to
completely stop the pulsation in the tumor. The sac was then
laid freely open, the clots turned out, the cavity sponged, and the
wound was now found to be in the common carotid artery, just below
the lower border of the omo-hyoid muscle. The muscle was drawn
upward and upon examining the posterior wall of the sac, the tissues
of which were much altered in appearance, a considerable vein was
seen to cross the artery at this point and enter the internal jugular,
which, as is usual in such cases, almost completely overlapped the ar-
tery. In attempting to draw it to one side, its walls, probably softened
by inflammatory action, gave way, and a fearful gush of venous blood
was the result. This was instaneously checked and controlled by pres-
sure. A ligature was now thrown about the artery above and one be-
low the wound. The internal jugular was next ligatured above and
below the point of injury and the vein entering it here had also to be
ligatured, making five ligatures in all. The wound was well cleansed,
its edges brought together by sutures, the ligatures brought out near
the inferior angle, a compress was applied, and the patient placed in
bed. "Progress in general was good, without cerebral disturbances,
and a certain rise in temperature. On the 21st day the ligatures came
away from the arteries, and on the 29th from the vein. Restoration to
health and strength complete. In describing this case the author says
that he has found only one similar, that of Syme. This has already
been quoted above.

OBSERVATION 6.—The latest case which I have succeeded in find-
ing out is announced by H. Morris[18]. It differs considerably from the

[18] A case of aneurism of the external carotid, in which, after failure of the liga-
ture of the common carotid, the old operation was performed successfully. British
Medical Journal, 1880, vol. ii, p. 705.

others both as to its nature and technical difficulties as well as the
mode of operation. The patient was a woman, æt. 45, and the tumor,
of the size of a walnut, was situated at the level of the division of the
common caroted artery. It was said to have arisen eight months be-
fore. The common carotid was ligatured with catgut at the point of
election. Pulsation of the sac recommenced four and a half hours af-
ter the operatton, and went on for a month. It then disappeared, but
pulsation could still be fett in the external carotid artery. Six months
later a non-pulsating tumefaction appeared below the angle of the
jaw, accompanied by the former symptoms (pain in the head and neck,
dryness in the throat and difficulty in swallowing); as after four weeks
the symptoms seemed to indicate the presence of pus an incision was
made through which some pus escaped; the unhealed wound began to
bleed, and, half a year after the first operation, the aneurismal sac
hurst, causing fearful straning of the integuments. Then Morris liga-
tured the facial and the superior thyroid arteries, cut through the sac,
removed the coagulum, and having convinced himself that the blood
flowed out of the peripheric end of the sac, sought out the artery and
ligatured it. Examination evinced that all the blood did not flow
into the sac from the carotis interna, and that the clot did not
legthen out into its lumen. The author on the strength of these
observations concludes that after ligature of the common carotid ar-
tery the blood does not get into the inferior end of carotis internal ar-
tery, and that, therefore, in similar cases not only the carotis common
but also the branches of the carotis external artery should at the
same time be ligatured, to avoid the flow of blood into the sac.

These seven cases, some given in summary and some in
extenso, represent the whole of the material which I have
been able to find in the literature accessible to me. The most
important points are given in the accompanying table.

The most striking circumstance in these cases is the fact,
that, in spite of the importance of the operation, nearly all
those who were operated upon recovered. With the excep-
tion of the case of Morel, which happened so long ago, we
have, of seven cases, six of recovery. Even in the case of
Weir, death did not result from the operation, but from the
injury done at the time to the spine. The methods adopted
by the surgeons (putting aside the cases of Morel and Sisco,
about which we have but scanty particulars) were not alto-

Number	Name of Surgeon.	Date of Ligature	Name of Patient.	Remarks.	Result.	Source.
1	Morel, Surgeon of the Charite. Paris.	Close of 17th century.		Absence of particulars.	Death of hæmorrhage.	Broca. "Aneurysmes," page 214.
2	Sisco.	1829.	Fran. Nasoni, æt. 17.	An. traumaticum in consequence of a wound inflicted by a knife several days previously.	Recovery.	Bulletin de Ferussac. After Lefort.
3	Leeds, (probably Hey).	1829.	John Pratt, æt. 43.	An. traumaticum since 10 weeks. First, artery was ligated below aneurism; opening of sac; then peripheric ligature.	Recovery.	London Med. Gazette, 1829, vol. i, p. 821.
4	Syme. Edinburgh.	1859.	David Craig	An. traum. car. sin. after dagger wound inflicted seven weeks previously. Operation by method of Syme.	Recovery.	Edinburgh Medical Journal, 1857, p. 105. After Holmes and Lefort.
5	Weir. America.	Sept. 30, 1862.	Soldier, æt. 23.	Shot in the neck on Sept. 17. An. traum. diffused. Operation by Syme's method.	Death owing to simultaneous injury of the spine.	Medical and Surgical History of the ar. I Surg. Vol., pp. 456-457.
6	Frothingham. America.	1876.	H. O., æt. 33.	An. traumat. since 34 days after explosion Digital compression at origin of artery. Opening of sac to admit a finger; pressure of wound.	Recovery.	American Journal of Medical Sciences, 1876 October.
7	H. Morris. London.	1880.	Woman, æt. 45.	Bursting of aneur. sac after ligature of com. carotid artery.	Recovery.	British Medical Journal, 1880, vol. ii, p. 705.
8	Matlakowski. Warsaw.	April 24, 1887.	Chruscikawska, F., æt. 41.	An. traum. car. dextræ after cauterization of cyst contiguous to artery, with ligature 4 week after formation of aneurism	Recovery.	"Gaseta Lekarska." Medical Gaz., year 1888, Nos. 6, 7, 8, 9.

gether alike. Hey, first of all, ligatured the common carotid artery between the aneurism and the heart. Morris, in proceeding to open the sac, found the artery already ligatured after the first operation. Frothingham purposely made an opening in the lower part of the neck, and from thence exercised pressure on the vessel before he proceeded to open the sac. Syme and Weir, not having space enough for a similar manipulation, endeavored to diminish the danger of hæmorrhage by opening the sac sufficiently to admit two fingers, thus serving the two purposes, first, of finding the wound in the artery, and of obstructing the opening of the sac. As to my case, being of the opinion that only the very rapid getting at the opening of the artery made it possible to diminish the frightful hæmorrhage, I made a free incision without any introductory manipulation.

Of course the conduct of the surgeon must be influenced by the individual circumstances of the given case. Theoretically, the common carotid artery should, first of all, be ligatured peripherically, and only in those cases where it is impossible to do so, the modification proposed by Syme adopted.

On the strength of the above cases we come to the conclusion, about which there cannot be any doubt, that, *in cases of traumatic aneurisms of the neck, the only sure method worthy of modern surgery is, ligature of the vessel on both sides of the wound in the artery, and simultaneous opening of the sac.* All other methods, such as pressure with all its variations, galvanopuncture, injection of blood-coagulating remedies, and so on, though they might even, in some cases, show good results, must be set aside as uncertain, often dangerous, always exposing the patient to delay and thus diminishing the favorable chances of the principal operation.

The method of Antyllus agrees with the fundamental principle accepted by surgeons only as to the stoppage of arterial hæmorrhages in general. This has been emphatically formulated in modern times by Maunder[19] and Ed. Rose[20] thus:

[19]Lettsomian lectures on the surgery of the arteries. The Lancet, 1875, summarized in Virchow's Yahresbericht.

[20]Ueber Stichrwunden der Oberschenkelgefässe und ihre sicherste Behandlung. Sammlung klin. Vortrage, Nos. 89-92.

That the ends of the bleeding vessel be ligatured at the very
point of the injury; besides which the latter advises excision of
a part of the artery for the purpose of being perfectly certain
that no branch departs from the space between the ligatures.
Lefort[21] also, in an article often quoted by us, says distinctly:
"la ligature des deux bouts isolés de l'artère, a l'endroit même
on elle a éte blessèe, est le traitement le plus rationnel." It
would be superfluous to multiply quotations on this subject
which is the alphabet of surgery. One should, however, be im-
bued with this principle also as regards aneurisms. Neverthe-
less we hear of frequent cases indicative of the surprising fact
that this fundamental principle is not taken into consideration, or
is put into practice too late; after other humbugging but more
easy methods have been tried, to the injury of the patient.

*The second indication, besides traumatic aneurisms, is the
rupture of aneurisms treated according to other methods.* Among
the cases which we have mentioned, that of Morris belongs to
this category. Lefort mentions three other cases of hæmor-
rhage after rupture of the sac.[22] In these three cases one pro-
ceeded to ligature the common carotid artery; in two of them
there were subsequent hæmorrhages; the patient of Nicoli re-
covered (*Gazette Med.*, 1851, p. 570); the patient of Scriven
died of recurring hæmorrhages (*The Medical Press*, 1865, p.
563); and lastly, the patient of Robertson, after bursting of the
sac, had hæmorrhage into the cavity of the mouth; the com-
mon carotid artery being ligatured, he recovered (*American
Journal*, 1838, vol. xxii. p. 221).

We see, therefore, that the above rule as to carotid arteries
was observed only once; in the other cases the operators re-
stricted themselves to simple ligature of the vessel, centrally
from the aneurism. Even in cases of the deeply situated
internal carotid artery the method above recommended gives
good results, as the following two observations testify: In the
case of an S-like wound below the left angle of the jaw there
was fearful hæmorrhage; Lee seeks out the central end of the
internal carotid artery (while the common carotid artery is

[21]Dictionaire "Carotide," p. 62r.
[22]Loc. cit., p. 624.

being pressed) and ligatures it in the wound; as soon, however, as pressure is removed from the common carotid, renewed hæmorrhage from the peripheral end, which Lee also ligatures; recovery.[23] During the discussions referring to the case of Prewitt, Wm. Briggs relates the following case: A young man with aneurism in the neck presented himself five weeks after having been wounded; at first it was supposed that one of the branches of the external carotid artery had been injured, but at the operation it appeared that it was the internal carotid artery which had been hurt. The sac was opened, the opening in the artery obstructed by a finger, the artery then ligatured above and below the wound; recovery.[24]

The case of Prewitt also, though ending in death, does not oppose the rule above given. In this case, that of a youth, æt. 17, an aneurism of the internal carotid artery had arisen in consequence of a shot wound on the level of the foramen caroticum; three months after the injury there was a distinct tumor in the pharynx. A ligature was carried about the common carotid artery, but pulsation commenced after a few months. Prewitt decided on opening the sac and ligaturing the peripheral end; it then became evident that the sac extended to the base of the skull, to which it adhered, so that the artery could not be got at from that side. Prewitt therefore delayed the operation; applied a drain and dressing. On the eighth day there was hæmorrhage; then a tampon of iodoform lint was used. The patient died twenty-five days after the operation from exhaustion.[25] The danger of pressure on the neck is proved by a case related by Vander Veer, in which, on pressure being occasioned for the third time, the patient suddenly expired, probably from epilepsy. For this reason Ford Thompson recommends the treatment of aneurism of the internal carotid artery, opening of the sac and ligaturing

[23]Double ligation of the interual carotid artery, 1869, by Lee. American Journal of Medical Sciences. January. Summary in Virchow's Tahresbericht for the year 1879.

[24]Revue des Sciences Médicales, 1886, vol. xxviii, f. 2, p. 611; (summary from the Trans. Amer. Surg. Assoc., vol. iv, 1886).

[25]Idem.

both ends; in case of want of room he counsels cutting through the ascending branch of the jaw.[26]

In general we, in modern times, more and more frequently meet with descriptions of cases treated according to the method of Antyllus, and its application is more and more frequently recommended. Paget, in finishing the description of his classical case, says of the method of Antyllus: "I have no doubt, that as more cases are brought under observation, the above method will find more frequent application. Taken generally, nothing can be urged against it except that one face the violent hæmorrhages, which must be rapidly put an end to. This method ought to be adopted in nearly all cases of rupture of the arteries." [27]

From this rule, Paget excepts ruptured aneurisms of the popliteal artery in which he advises ligation or amputation. Largeau[28] in a work, written in consequence of the splendid results of an operation according to the method of Antyllus performed by Blum on an aneurism of the popliteal artery, has gathered 25 cases, from which it appears that these aneurisms also, may be operated upon according to the method of Antyllus. In these records there is no mention of two cases, previously announced by Horoch,[29] successfully operated by Albert. In the opinion of Horoch: "In the treatment of small, circumscribed, newly formed and even in large circumscribed, old aneurisms, surrounded by strong walls, one may successfully try digital pressure, before proceeding to the radical operation, but in diffuse, newly formed aneurisms the only proper method seems to be that of Antyllus," "which is not more dangerous than any other important manipulation."[30]

[26]Revue des Sciences Medicales. 1886, vol. xxviii.

[27]Aneurism in the femoral artery with rupture of the sac. Lancet, April 24, 1869.

[28]Du traitement des anéurysmes poplités par la Méthode d'Antyllus. Archives Generales de Medicine, 1885, p. 267.

[29]Ueber die Behandlung der Aneurysmen nach der Methode des Antyllus. Allg. Wiener Med. Zeitung. 1883. Nos. 18 und 19.

[30]Weun wir nun kurz resumiren, so sind wir zum Schlusse der Ansicht; dass bei kleinen circumscripten frischen und vielleicht auch bei grossen abgeschlossenen und mit einer festen Wandung umgebenen alten Aneurysmen, ganz wohl die Digital-compression versucht werden kann, ehe man zur Radicaloperation schreitet, dass aber bei diffusen frisch enstandenen Aneurysmen einsig and allein die Methode nach Antyllus indicirt erscheint.

Largeau at the close of his work gives the following indications as to aneurisms of the popliteal artery. Ligature according to the old method is indicated: 1. In all traumatic aneurisms. 2. In diffuse aneurisms when rupture or suppuration is to be feared. 3. In circumscribed aneurisms, when pressure has failed, and then without delay, not waiting until they have attained a large size. The earlier the operation is performed the easier it is and has the more chances of success.[31]

As to aneurisms of the axillary artery, T. Holmes says that although Syme is wrong in putting the method of Antyllus above the ligature of Hunter, there are, nevertheless cases of injury to the axillary artery, and very rare cases of aneurisms of that vessel, in which the preference given to the method of Antyllus is fully justified, always however keeping in view the possibility of amputation. As to aneurisms of the carotid artery, he remarks that Syme's case leads to the question whether in aneurisma spontaneum it would not be advantageous to recommend the method of Antyllus in preference to simple ligature.[32]

Gueterbock in his summary of Scribe's work says: "The satisfactory progress of operations according to the method of Antyllus which has in modern times been observed rather than the doubtful result of statistics ought to rouse one to imitation."[33] P. Vogt while giving the highly unsatisfactory result, founded on the statistics of Wyeth, of ligature of vessels in aneurisms, expresses himself in favor of the same views.[34]

[31]La ligature par la Méthode ancienne est indiquée: 1st, dans tous les anéurysmes traumatiques; 2d, dans les anéurysmes diffus sur le point de s'ouvr en dehors ou suppurés; 3d, dans les anéurysmes circonscrits ou 'la compression aura echonée et cela sans attendre qu'ils prennent un très gros volume. (Loc, cit., p. 314.)

[32]Lectures on the surgical treatment of aneurism and its various forms. Lancet. 1872. Summarized in Virchow's Jahresbericht for 1873.

[33]Der gute Verlauf, den die alte Operation nach Antyllus neurdings mehrfach genommen dürfte eher zur Nachahmung auffordern, als die zweifelhaften Zahlenergebuisse. Virchow's Jahbresbericht, y. 1885.

[34]Dass die Behandlung mit compression und Beihilefe dringend nahegelegt und für alle leichten wie Nothfalle von Ligaturen immer wieder die öetliché Doppelligatur, entweder bei Continuitätsligatur mit Durchschneidung des Gefässes zwischen beiden Ligaturen und bei Aneurysma mit Entleerung des Sackes der einfacher proximalen oder distalen Ligatur entschieden den Vorrang abgeroinut. Real-Encyclopàdie. II Auflage. 1885. p. 490.

Richard Barwell in his newly-edited international surgery says of the method of Antyllus,[35] In certain cases it, to this day, gives the only means of saving the life of the patient, and if the latter escapes the exhaustion which may result from the process of healing, he is cured of his aneurism radically and definitely." This operation is indicated in all cases of wounds or rupture of the arteries whieh have been falsely called "aneurysma traumaticum diffusum;" after failure of ligature, and also in those cases in which after ligature and the exercise of bending or pressure the aneurismal sac has burst. Passing on to aneurisms in particular, he weakens his praise of the method of Antyllus (p. 621). Speaking of aneurisms of the axillary artery with reterence to the case of Syme, he adds: "It is doubtful whether a saeciform aneurism of the first part of the axillary artery can be treated according to this method and even if this were possible, the mortality would probably be very great." "Syme's proposal of curing aneurisms of the groin and carotis in this manner, cannot be taken seriously." And further (p. 633). The old operation was lauded by Syme, in the treatment of carotid aneurisms, at the very beginning; but this vessel is anatomically unfavourably situated, it being very difficult, even impossible, to restrain circulation in it, and a surgeon reading Syme's description of his operation will have little wish to imitate him in this point; however, if the operation of Hunter has failed, and the aneurism increases, the old method may, with comparative facility, be adopted as the ligature obstructs the artery sufficiently, and affords a certain degree of safety. Under these conditions the operation has been performed twice in America and lastly in London, by Morris."

In these opinions, which I have purposely quoted in extenso, we find certain contradictions, for there is no doubt that if the operation has given good results in the most desperate cases success ought to be still more certain in easier cases. In contradiction of what has been said by Barwell, it is always possible except when the aneurism extends to the very clavicle (as in Syme's case and in my own) to avoid hæmorrhage by

[35]Fncyclopédie Internationale de Chirurgie, vol. iii, p. 563.

cutting through the sterno-cleido mastoid muscle. If it is possible in cases of struma to find and ligature the inferior thyroid artery, it is surely much easier in cases of large aneurisms to find the common carotid artery.

Taken generally the method of Antyllus has long been considered dangerous in cases of aneurism of the neck, axilla or groin, as also in very large aneurisms of other parts. The chief cause of danger has already been given by Oribasins; it consists in the unfavorable anatomical conditions, the situation of the tumor deep in among nerves and veins. In the course of time there was added the danger resulting from suppurative thrombosis of the veins, pyæmia, etc. This last danger has, however, now been removed; by strict aseptic treatment, *prima intentio* may with certainty be attained; even when the rigid walls of the sac do not after having been emptied fall together and approach each other by filling the sac with coagulum, healing without suppuration under a humid crust may be brought about.

As regards the difficulties resulting from the anatomical position the case is quite different. In that particular the greatest difficulties may arise. The most favorable position is that of aneurisms of the common carotid artery, the groin and thigh : that of aneurisms of the fossa poplitea is much worse, but the worst of all is the position of axillary aneurisms. As to the latter particularly it is extremely difficult to put into practice the method of Antyllus, for even after cutting though the pectoral muscle, there remains the close connection with the veins, and especially with the plexus brachialis which partly surrounds the artery. In our day of surgical triumphs, however, the surmounting of these anatomical difficulties cannot be considered an impossibility. Besides the inconvenient position of the aneurism with reference to the veins and nerves, as also the joints of the humerus and femur, great difficulties may be occasioned by the lateral arteries, which start from the sac itself.[36] These may, if not ligatured, become the source of

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[36]Instance: Case of Davies Colley. Aneurism, traum. femorale below the apex of Scarpa's triangle; relapse after Hunter's operation performed by Saxtorph. Colley made the old operation, besides that, ligatured a lateral branch of the thickness of the radial artery opening into the sac.

recurring hæmorrhages, while to ligature them, especially those which start from the deep side of the tumor, is unutterably difficult. But for a good anatomist and calm operator even this difficulty is not insurmountable, as is proved by many cases of aneurism of the poplitea which have been successfully treated according to the method of Antyllus. In cases of extraordinary difficulty caused by a muscle or even nerve, when the life of the patient is endangered, cutting through and then suturing these, with the view of opening up the way, seems indicated. This proposal should cause no surprise, for many counsel the amputation of a limb for the purpose of saving the life of the patient.

We do not speak of gangrene, as that is to be feared in ligature of Hunter, pressure, and all other modes of treatment, alike. The superiority of the method of Antyllus to all other modes of ligature is very great and unquestionable. This operation is performed systematically, and not by chance; all the branches and both ends of the artery are ligatured, and thus the most chances given of escaping recurring hæmorrhages. Whoever imagines that the simple ligature of Hunter or Anel (in cases of wound or rupture of artery) gives safety from hæmorrhage, has never closely observed the course of events. Thus it was in my case, as also in one of Dr. Jawdynski's, who, for cancer overgrowing the jugular vessels, had ligatured the common carotid artery and then cut it through between the ligatures. The moment after the peripheric end of the artery was as much filled with blood as before the ligature. In another case, of excision of a sarcoma in the groin, after ligature of, first, the iliacæ communis artery, second, the femoralis superficialis artery, and third, the femoralis profundæ artery, when my colleague, Jawdynski, cut off a lateral branch which started from that part of the artery which was between the ligatures, the blood gushed out in a stream, with only this difference, that the stream was not pulsating, but uniform. Broca dedicates an important chapter of his fine work to the subject of the immediate return of blood into the sac after ligature.

The second great advantage of the old method over simple ligature is the removal of the sac, which was liable to burst or

suppurate, or cause relapses, as has been proved in literature, and of which many examples might be given. In very bad cases, the method of Antyllus was resorted to, but of course it had then much less chance of success than if it had been adopted at the very beginning. The further superiority of the method to simple ligature becomes evident to everyone in cases of anomalous division of the artery, in which pulsation or hæmorrhage have recommenced, notwithstanding ligature.[37]

In the opinion of Follin[38] the ligature of Anel ought to be altogether proscribed in the treatment of varicose aneurisms. What has already been said in favor of the old method with regard to traumatic aneurisms may be repeated as to venous aneurisms, which are also of traumatic origin. If all other remedies have failed, the only sure means of cure is ligature of the vessel above and below the opening in the artery, with or without opening of the sac, as has been tried by Norris and Malgaigne.

The old method has often been severely criticized because of its great difficulties; but on the other hand, it has not been taken into account that other apparently more innocent methods do not give any security from fatal accidents, whereof we find many cases in literature, while there are probably many more which have never been recorded. The consideration of these accidents would lead us too far; we therefore avoid it altogether.[39]

[37]Among many instances that of Terry; Traumatic aneurism of the radial artery of the size of a child's head in the middle of the antibrachium; the arteria brachialis was ligatured without effect; it was only upon strict examination that the cause of failure was found to consist in the high division of the brachial artery. Ligature of arteries for aneurism. Lancet, Feb. 3. Summary in Virchow's Jahresbericht for 1872.

[38]Traité élèmentaire de Pathologie externe, vol. ii, p. 374.

[39]Here follow some examples from among many cases of ill-treatment of aneurism; instead of adoption of the straight road leading to good results:

I. Aneur. spont. poplit.; hyperflexio, compressio digitalis; sack with shot, tourniquet, twice injection of ferri ses-qnichlor; then eight drops of tannini jodatis finally, embolia, gangraena cruris, septicæmia, and death. Verneuil, Observations d'aneurysmes. Gaz. des hôpitaux, Nos. 111-117.

II. An. diffusum. a. poplit. sin., hyperflexio, pressure by sac with shot, exudate to the knee-joint, inflammation of aneurism, inflammation of entire skin, status typhoideus, amputation of femur, septicæmia, death. (Verneuil; ibidem.)

III. Strong man, æt. 31. In Scarpa's triangle aneurism since five months; pres-

sure under tourniquet during fourteen days; murmur disappeared, but tumor still en-
larging; extremity swelled; on the twenty-eighth day, mortification; exarticulatio
femoris; death three hours afterward. (St. George's Hospital Reports, summary in
Virchow's Yahresbericht for 1873).

IV. Patient æt. 58. Aneurism between both malleoli since three months. At first
was taken for an abscess and the skin incised; instead of proceeding to operate, one
delayed, on the fifth day the sac burst, hæmorrhage, lig. tib. an·. just above the
joint, but hæmorrhage ceased only after ligature of a. dorsalis pedis, just under the
entrance into the spatium interosseum. In the evening of the same day renewed
pulsation and murmur in the sac in consequence of the flow of blood through a
lateral artery running horizontally near the outer malleolus; the tourniquet of Petit
was applied to this small artery; development of new lateral branch on the tenth day
between the tumor and tib. antica; suppuration of sac, filled with coagulum. (Panas.
Aneurysmede l'artere pedieuse. Gaz. des hopitaux, No. 57, y. 1873). The above
instances might be easily multiplied.

SOME CASES OF PENETRATING STAB AND GUNSHOT WOUNDS OF THE ABDOMEN.[1]

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I N the subjoined cases are presented the histories of four cases of gunshot and two cases of stab-wounds of the abdomen, which have recently come under my care.

CASE I. *Penetrating Shot-Wound of Abdomen; Eight Holes in the Intestines; Laparotomy; Acute Pneumonitis; Recovery.*—J. K., colored, æt. 30, hod carrier, was admitted to the hospital August 11, 1890. One hour prior to admission he was shot at very close range by a 38 calibre pistol, the bullet entering the left costo iliac space about a half inch above the crest of the ilium, midway its convexity. The probe introduced readily took a course downward, forward and inward, passing well into the cavity. Pain was intense in the pelvic region, the muscles being well on guard, and the tenderness on pressure marked; dulness on percussion in left dorsal gutter; urine was drawn and found clear. Patient vomited during examination. There was total absence of shock; pulse 66, and of good volume; rectal temperature 99.6°F. respiration slightly accelerated and shallow.

From the direction taken by the probe, I judged that the ball had passed down into the left side of the pelvis. Believing this, I thought I could reach the injured parts better by opening the abdomen in the left linea·semilunaris. A four inch incision was made at this point, when the descending colon readily came into view, revealing two large holes, the mucous membrane of which was greatly everted. The holes were closed with the Lembert continuous suture, small iron-

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[1] Read before the Missouri State Medical Society, May 21, 1891.

dyed silk being used. The small intestine was now pulled out, and six other holes noted. As the cavity was full of fæces and blood it was thought best to make a median incision. This was done to the extent of seven inches. The holes were closed in the same manner as before and the cavity thoroughly irrigated with warm Thiersch's solution. A glass drainage tube was left in the lower angle of the wound, reaching to the bottom of the pelvis. Two large rubber tubes were put in the upper angle of the wound, draining either dorsal gutter.

Patient did remarkably well. His pulse never exceeded 100. save on two afternoons, and the temperature never rose above 102° F. On the fourth day acute pneumonitis of left lung developed. On the sixth day there was tubular breathing, and dulness on percussion, well marked over the entire lung. About this time a distressing hiccough developed which lasted several days. In spite of these complications patient made a complete recovery, and was discharged, well, September 29, 1890.

CASE II. *Gunshot Wound of Stomach; Laparotomy; Death.*—J. E., colored, æt. 23, a laborer, admitted June 9, 1889. Six hours prior to admission he was shot with a 38 calibre pistol at a distance of twelve feet. The bullet entered the sixth intercostal space two inches to the left of the sternum, passing downward and inward through the diaphragm into the belly cavity. His temperature was 102°F., pulse 110, respiration 32. He complained of intense pain in the epigastric region, which was greatly intensified by pressure. The abdomen was somewhat distended and tympanitic; liver resonance marked.

A median incision was made from the ensiform cartilage to two inches below the umbilicus. Two holes were found in the stomach— one two inches below the cardia on the anterior surface, the other a little posterior to the greater curvature, four inches below the cardia. A good deal of blood and food were found in the peritoneal cavity, which was washed out and the holes in the stomach closed by the Lembert suture. The abdomen was closed without drainage. Time of operation forty-five minutes.

Patient stood the operation well and did remarkably well for four days; in fact he seemed to be out of danger. The temperature, after the second day, had remained about 99.5° F. On that day, while turning over in a narrow bed during sleep, he fell to the floor, striking his abdomen. Severe pain developed at once. Pulse became rapid and weak, and extremities cold, evidencing well developed shock. This was followed in a few hours by a temperature of 104.5° F. The

condition continued to grow graver rapidly and death supervened 24 hours after the receipt of the injury.

The post-mortem showed that the anterior hole in the stomach had been torn open by the fall. There were several ounces of blood in the vicinity of the tear.

This case ought to be viewed as a successful one, for I think it will be admitted that the history shows that but for the untoward accident, recovery would almost undoubtedly have ensued.

CASE III. *Gunshot Wound of Liver; Excessive Hæmorrhage; Laparotomy; Recovery.*—T. H., æt. 19, laborer, a delicate looking boy; admitted October 6, 1890. Four hours before admission, in an attempt at suicide, he shot himself with a 44 calibre pistol, the bullet entering the seventh interspace in the right mammary line. His pulse was 112; temperature 102° F.; respiration, 40. Percussion gave dulness low down on both sides of the abdomen. There was tenderness on pressure over the epigastrium. The probe passed downward and forward.

The abdomen was opened from the ensiform cartilage to the umbilicus. A considerable amount of fluid and clotted blood was washed out, and a careful examination showed that the upper wound of the liver, even in the short space of four hours, had become adherent to the diaphragm. I made no effort to disturb it, as by breaking up the adhesions I would, doubtless, have re-opened the source of the hæmorrhage. The bullet passed through the right lobe of the liver. I was not able to see the lower hole, but determined its locality by the hæmorrhage. The bleeding showed no disposition to stop, hence I packed a handful of gauze under the organ, leaving the ends of the strips hanging from the upper angle of the wound.

Patient rallied well. The next morning his temperature was 101.5° F., pulse 120, respiration 36. He remained in about this condition for several days, after which he steadily improved. His temperature was never above 102° except on three occasions, when the thermometer registered 102.5° F. The gauze was removed on the third day and the wound closed. It healed by first intention. He was discharged, well, November 6, 1890.

CASE IV. *Gunshot Wound of Colon; Laparotomy; Recovery.*—W. C., æt. 26, a strong, stout man, five hours before admission was shot at close range by a 44 calibre pistol. When admitted, his pulse was 118 and weak; rectal temperature, 100.8° F., respiration 30. The

ball entered in the left lumbar region, and was discovered under the skin three inches to the left of the umbilicus.

An incision four inches in length was made in the left linea semilunaris. A single transverse hole was found in the colon. Some fæces and blood were noted in the vicinity. This was carefully sponged away, and the hole in the gut closed by the Lembert suture: the peritoneal holes of entrance and exit were closed in the same manner.

Patient recovered without an untoward symptom.

CASE V. *Penetrating Stab Wound of Abdomen; Laparotomy; Death.*—F. S., æt. 33, admitted October 12, 1890. Six hours before admission he was stabbed in the abdomen, after which he became sick at the stomach and vomited several times. A penetrating wound was found in the median line two inches below the umbilicus. This was enlarged and the intestines in the immediate vicinity examined and found intact. The omentum was cut to the extent of an inch, and one of the large vessels of the same was seen to be bleeding profusely. The vessel was tied, and the wound in the omentum closed. The blood was washed from the cavity, after which it was closed by interrupted silk sutures. A glass drain was left in the lower angle extending to the bottom of the pelvis.

As the tube ceased to drain on the second day it was removed, and gauze packed in the hole. Patient did well. The next day his temperature was 99.5°F., pulse 88, respiration 32. On the morning of the third day I found him very much worse. He had been vomiting for some hours, pulse was weak and rapid, and extremities cold. He was virtually in collapse. I removed the dressing and was astonished to find that about a foot of small intestine had escaped through the drainage hole. It was cold, quite dark, and greatly distended.

The opening was enlarged, the gut irrigated with hot sterilized water, and returned to the cavity. Patient did not rally and died in 24 hours, death being evidently due to shock.

The drainage tube used was half an inch in diameter. As I had never read or heard of such an accident I did not take its possibility into consideration. Recent teaching has been (and certainly my experience justifies the belief) that adhesions soon form around the drainage-tube. By the third day, at least, we have heretofore felt perfectly safe on that score. After removing the tube I should have closed the hole with a heavy silk suture.

CASE VI. *Stab Wound of Ileum; Laparotomy; Recovery.*—J. K.,

æt. 22, a roofer, was admitted March, 13, 1891, in a drunken, boister-
ous condition. From a policeman we learned that he had been
stabbed three hours prior to admission. He vomited several times
during examination of the wound, and did so frequently afterward.
There was no shock; temperature, 98.6° F., pulse 98, respiration 20.

A penetrating wound was noted a half inch to the right of the um-
bilicus. An incision four inches long was made in the median line,
and the gut examined in the vicinity of the wound. Two holes were
found in the ileum, showing that the knife-blade had passed through
and through the gut. One hole (the hole of entrance) was an inch in
length in the long axis of the gut. The other was scarcely a quarter
of an inch long, and on the opposite side of the gut, both being about
three-quarters of an inch from the mesenteric attachment. A good
deal of blood and some fæces were washed out and the holes in the
gut closed by the Lembert suture. The abdomen was closed without
drainage.

Patient made a rapid recovery. Temperature never exceeded 100°,
save on one afternoon. The highest pulse rate, after the first day, was
98.

REMARKS.

In the management of gunshot wounds of the abdomen there
are four cardinal points to be constantly borne in mind, the
strict observance of which I am firmly persuaded will affect
the issue in the case.

1. Have everything in readiness, the patient thoroughly pre-
pared, the abdomen thoroughly cleaned, and the surrounding
surfaces covered with antiseptic cloths before an anæsthetic is
administered. I have seen patients kept under an anæsthetic
for ten or fifteen minutes while the operator and assistant
were getting things ready. This materially lessens the chances
for recovery, for it is well known that the shorter the period
of anæsthesia the less the shock, etc.

2. After the abdomen shall have been opened the first busi-
ness in hand should be to find the source of the hæmorrhage,
if any, and check the same. I speak from sad experience on
this point, for I believe I lost a patient from lack of the ob-
servance of this rule. While sewing up gunshot holes in the

small intestines, which were not bleeding, and the closing of which could just as well have been delayed, a fatal hæmorrhage was going on at another point.

3. As far as possible the intestines should be kept in the peritoneal cavity. I know, however, that this cannot always be done. All know that useless handling of the gut, and the dragging upon its mesentery, as well as the exposure to cold, etc., adds greatly to the shock.

4. To finish the operation at as early a moment as possible, consistent with the proper management of the same.

It is impossible to lay down hard and fast rules for the government of the surgeon in his dealings with these cases, as the difficulties in each must be surmounted as they arise.

THE MÜTTER LECTURES ON SELECTED TOPICS IN SURGICAL PATHOLOGY.

SERIES OF 1890-1.[1]

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LECTURE IX.

MIXED AND SECONDARY INFECTIONS.

(CONTINUED.)

SYLLABUS.—Infections complicating-pneumonia: Influenza; Measles; Scarlatina; Typhoid fever; Septic angina; Mumps.

PNEUMONIA. Only during the last few years has pneumonia been assigned a place among the septic infectious diseases. This is largely due to Jurgensen. Until very recently there has been some doubt as to which of two or three well-known organisms was really the specific excitant of these cases. But enough has been already said to show that every specific infectious disease is produced by organisms whose general habits and points of attack are well known, but that no part of the body is necessarily or always secure from their invasions. And so it is with pneumonia; while in all probability the coccus with which Fränkel's name is so closely associated is the exciting agent, as shown in Lecture IV, this organism has been known to be the solitary form met with in pus from certain post-pneumonic complications. Such se-

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[1] Delivered before the College of Physicians, Philadelphia, March, 1891.

quelæ of pneumonia have been known for many years. Chomel mentioned some years ago that rheumatism, as he regarded it, frequently followed pneumonia as it did typhoid. Grisolle treated of arthralgias and arthritides of pneumonic patients. In the only one of four cases of extensive joint involvement in which he could make a post-mortem examination, he found the affected joint full of pus.

In 1840 Parise presented to the Anatomical Society the report of a man who, following pneumonia, had what was termed articular rheumatism of both shoulders and one knee; finally one shoulder joint suppurated with the customary local signs and, at the autopsy, there was found also pericarditis with effusion, which had not been recognized during life. About this time also Chomel expressed the opinion that rheumatism not only attacked healthy patients but those suffering from other diseases, like typhoid, pneumonia and especially the various chronic diseases. In 1850 Andral reported, under the name of sub-acute rheumatism, terminating rapidly in death, the case of a woman, æt. 67, convalescing from pneumonia of the lower left lobe, who was seized with violent pain in both shoulder-joints and the right elbow, with swelling and redness of the skin; dying eight or nine days later, pus was found in both shoulder-joints and sero-purulent fluid in the elbow. Nothing was found to betoken a purulent resorption. Gintrac has published a case in which pneumonia, pericarditis and articular abscesses were all met with. At the time those cases were published they were all regarded as of rheumatic origin. Thus Grisolle, writing in 1841 in his treatise on Pneumonia, asks, "What is the nature of these articular pains which I shall describe? Can they be considered as rheumatic, etc?"

These clinical observations were made in a previous generation, and yet have no small clinical value, for they proved that multiple joint abscesses might complicate pneumonia, and that in the first days of this complication it might be mistaken for a rheumatic affection. In all probability such cases are, strictly speaking, of metastatic origin, and are brought about by well-known embolic lesions. For instance, the section in a case of Jaccoud's showed the following condition of affairs: The right lung in a condition of gray hepatization, beset with

numerous small abscesses; the heart gave evidence of a sep-
tic endocarditis; in the cortex of the kidneys were numerous
miliary abscesses; the right knee and shoulder contained quan-
tities of pus, and near the right shoulder was an abscess in the
soft parts which connected with that in the joint. The train
of lesions in such a case is not difficult of recognition. Ab-
scesses in the lungs produced endocarditis, and infected em-
boli from this source caused the abscesses in other parts of the
system. The bacteriological investigation of this case was very
interesting. In the lungs were found Friedländer's pneumococ-
cus, along with pyogenic forms. These latter were easily recog-
nized in the affected endocardium, and in the peripheral
abscesses. They had also been found in a drop of blood
taken from the patient before death. This would seem, there-
fore, to be a true secondary infection by pyogenic cocci ac-
cording to their well-known capability of action.

Jaccoud, referring to cases of genuine croupous pneumonia which in their course
presented pyæmic symptoms, found depots of pus inside the pneumonic infiltrate.
In this pus, as well as in that of numerous metastatic abscesses, he has found nu-
merous pyogenic bacteria along with Friedländer's pneumococcus. And two years
before Jaccoud Naunyn (*Berl. klin. Woch.*, 1883, No. 29) had called attention to
the purulent alveolar contents in cases of croupous pneumonia.

Schüller has reported two cases of monarticular joint ab-
scess immediately following pneumonia, both of which neces-
sitated resection. One such case has happened to myself, the
shoulder being the joint involved, the abscess occurring before
recovery from pneumonia was complete, perforating the joint,
being evacuated by large external incision with counter open-
ing, and so far involving the usefulness of the joint itself as to
lead me to advise a resection, which, however, the patient, an
elderly man, declined.

Massalonga, in Tregnago, observed an epidemic of pneumo-
nia which was peculiarly severe throughout, and from which
the mortality was about 30%. Among the various complica-
tions which attracted his attention, articular manifestations,
which he called acute articular phlogosis, were quite common,
but as a rule were not of severe character. Analysis of vari-
ous clinical reports makes it appear that post-pneumonic ar-

thritis is usually multiple, although the shoulder is most fre-
quently affected. It may occur early in the disease or during
convalescence. The articular lesion is characterized by a burn-
ing pain coming on suddenly and spontaneously with exacer-
bations, and increased by pressure or movement. There is
always swelling, sometimes fluctuation, often without superfi-
cial redness. A number of times pus has been found when
the external appearances would not lead one to suspect its
presence. Grisolle has called attention to the marked con-
trast between the purulent effusion and the condition of the
surrounding parts, inasmuch as he met only with a trifling in-
jection of the synovial fringes. Andral also observed nothing
but an intense congestion, and Gintrac speaks of nothing but
synovial redness. It is seldom under any circumstances that
so much pus is observed in a joint with so few evidences of
tissue alteration.

In his paper before the German Surgical Congress, before
alluded to, Schüller reported the discovery of metastatic joint
abscesses in five bodies thus dying from pneumonia. He care-
fully examined the pus from all these and recognized strepto-
cocci, as well as pneumonococci of Friedländer. There appear
to have been no instances of post-pneumonic bone abscess re-
ported, nor has the writer anything to add on this subject ex-
cept that, reasoning from analogy, it would appear to be strange
that their occurrence has not yet been noted, and that it need
surprise no one should their occurrence be described at any
time. As a matter of interest, yet not bearing directly on the
present subject, it is worth while to remark that myalgias and
arthralgias have been described by at least two different writ-
ers as causing a very unpleasant or distressing feature of pneu-
monia.

Gabbi has endeavored to produce experimentally a suppur-
ative arthritis by injecting Fraenkel's diplococcus into the
joint cavities of rabbits. When he combined the injection
with mechanical irritation he got unmistakable disturbance;
but the simple injection of the coccus produced only a sero-
purulent exudate.

Monti studied the exudate from a case of arthritis which
developed in the wrist of a patient suffering from double pneu-

monia along with pleuro-pericarditis, and found a pure culture of the diplo-coccus. Belfonti had a quite analogous case, involving also the wrist, which he studied with the same result. He regarded the localization of the joint lesion as an instance of mycotic embolism due to specific endocarditis. These cases serve as a further illustration of the pyogenic power of Fraenkel's coccus.

Acute meningitis is known to be caused sometimes by this diplococcus, even though the patient at the time is not suffering from active pneumonia.

A recently reported case, of Fraenkel's, is a most interesting confirmation of this fact. A man, æt. 32, shot himself in the left temporal region; there were no brain symptoms, and the external wound closed promptly. In twenty-one days he seemed completely well. At this time he was suddenly taken with a severe chill, followed by serious symptoms, and death ensued in five days. At the autopsy a collection of puruloid material was found between the dura and the supra-orbital plate of the frontal and beneath it. Cultures of it, as well as from various parts of the intensely congested brain, from the ventricular fluid, and from blood from other parts of the body, showed it to be a case of septic infection from the diplococcus pneumoniæ. This organism in all probability gained aceess trom the nose, which would seem to indicate that careful disinfection of the nasal cavity is advisable in those injuries to the bones of the skull where direct or indirect connection with these cavities may occur.

In parenthesis it may be stated that the paths of lymphatic conduction have been recently clearly traced from the nasal mucous membrane into the brain itself, and an explanation for certain brain abscesses is afforded by this statement of anatomical fact. A most interesting case lately under my own observation is one of frontal abscess following an operation for the removal of nasal polypi. At another time and place I shall report it in greater detail.

Testi has reported a case of double-sided parotitis which developed in the course of a case of croupous pneumonia, in which he found Fraenkel's diplococcus. This organism was also found in the pus from the pleura, as well as in that of several superficial abscesses from which the same individual also

suffered. Gabbi has studied some of these secondary lesions and regards the tonsils as playing a considerable *rôle* in some of them. In the ulcerated follicles, as well as in other parts of the body, he found the pneumococcus of Fraenkel, and along with it, in the tonsils, the staphylococcus aureus; both were also found in the saliva.

Zaufal has recognized the pneumococcus in the purulent discharge from six cases of otitis. He reports seven further cases of pneumo-diplococcus otitis, four of them complicated with mastoid abscesses, which were all caused by this same organism. Levy and Schrader have investigated fourteen cases of acute and two of chronic suppuration of the middle ear; in several of them the diplococcus was found.

Verneuil claims to have found Fraenkel's coccus in the pus of a subperiosteal mastoid abscess which resulted from an otitis media, and which latter was the result of an operation on the nose. It is reported also that Netter found the pneumo-coccus not less than thirty-five times out of seventy-five cases of otitis media studied.

INFLUENZA.

The pandemic character of the spread of *la grippe* a year and a half ago caused the most intense interest in its character and pathology. Not alone to physicians was this a matter of importance, but to surgeons as well, since there resulted from it not a few cases which sooner or later came into their hands for treatment. Although I know of no satisfactory and definite conclusions as to its nature, I have seen more than one of its surgical sequelæ.

It is well known that a disease of a similar character has been epidemic among animals, especially among horses, and that inflammations of joints are a frequent complication of these cases. Indeed, upon the continent, cavalry garrisons have been almost disabled or placed *hors du combat* by reason of this, consequently it would be an oversight not to mention it among the diseases under consideration in this lecture. Arthralgias have been very common. A true serous synovitis occurs occasionally, while more destructive forms seem less

known. Witzel describes, for instance, a case of severe peri-
ostitis of the tibia, and calls attention to the similarity between
this case and similar cases occurring after typhoid. He de-
scribes also a similar case involving the lower portion of the
femur, in the person of a little child. He alludes also to the
occurrence of necrosis as well as to the frequency of later fun-
gus inflammations of bones and joints. At least one case of
pyarthrosis, mainly of the knee, occurred under his observa-
tion, and he alludes to the fact that in the sero-purulent fluid
from such a joint Ribbert had discovered streptococci. Evi-
dently, then, la grippe is not a disease which surgeons can af-
ford to completely neglect.

Within a week I have had to open a large subfascial abscess
of the thigh, evacuating nearly a litre of pus, which made its
appearance while the patient, a man of 31, was recovering
from the acute stage of the grippe. He had been previously
well, and had not injured himself, so far as known.

In a recent number of the Bulletin of the Academy of Med-
icine, an article by Verneuil shows that the influenza has been
followed by a relatively large number of sequelæ, whose main
pathological feature is suppuration. He has observed suppura-
tive infections of the eye, ear, joints, pleura and pericardium,
as well as superficial and deep abscesses of the skin and glands,
and collections of pus in the antrum and the frontal sinus.
These were treated by proper surgical measures, but seemed
more rebellious than do similar lesions under ordinary circum-
stances. All of which is to be explained probably by the marked
depreciation of the patient's general health. He also observed
that patients who were in the stage of recovery from operations,
when attacked by the grip, suffered from complications which
were often serious. This fact was also noted by Walther of
the Charité Hospital, who observed a remarkable slowness of
the healing processes under the same circumstances. Cica-
trization was retarded and not re-established until after com-
plete cessation of the acute febrile symptoms.

Demons, of Bordeaux, mentions quite a number of surgical
complications of the grip under his observation. Otitis com-
plicated with mastoid abscess, severe inflammations of the eye,
acute orchitis, and other equally severe lesions occured several

times.   He also saw formation of abscess in the axillary glands
as well as elsewhere, although none of the ordinary causes of
suppuration could be found.   He furthermore states that in
all wounds in his wards, healing was slow and suppuration
profuse.   According to his opinion, during an epidemic of the
grippe it is most wise to abstain from all operative procedures,
and especially those involving the nasal, buccal, pharyngeal
and respiratory tracts, which are especially liable to be at-
tacked by the disease. Evidently then the prognosis of opera-
tions performed during an influenza is a matter carefully to be
considered, and the wisdom of postponement of all operations,
not immediately necessary, until the patient has recovered
from the debilitating effects of the disease, is most apparent.

MEASLES.

Concerning the relation between measles and consecutive
suppurative lesion, there is but little to be found in literature.
Demme observed two cases of acute osteo-myelitis consecutive
to measles, one a 5 year old girl who developed an abscess
in the upper end of the tibia, which was opened on the 6th day
after the disappearance of the eruption. She recovered.
Another girl, æt. 9, five weeks after the disappearance of the
exanthem, developed an abscess in the lower end of the tibia,
accompanied by chills, nausea and high fever.   This evacuated
itself spontaneously eleven days later, and in a month she was
well.   It must be said of the latter case, however, that it is un-
certain whether it should be put in this catagory, or was not in
effect a purely idiopathic affection.

Luecke lays special stress upon measles in discussing ætio-
logy of bone and joint diseases.   He emphasizes that in the
course of the disease, and especially during convalescence, the
bones and joints were frequently seats of affection, and that it
has been known in all ages that children who have suffered
from measles very often quickly develop the so-called scrof-
ulous appearances, which are not confined to the glands and
skin alone, but frequently affect these deeper parts; and Witzel,
in commenting upon the above statement, states that he knows
of no one of the diseases of children which appears to furnish

so favorable soil for tuberculous processes as this, stating that scarcely a week passes without the appearance of some patient whose fungus inflammation has developed shortly after measles. (Gibney, *Med. Rec.*, June 3, 1882.)

In 1845, Bonnet in his treatise called attention to the fact that in the eruptive fevers which have pursued a somewhat irregular course, when the eruption is incomplete there appear often pain and disseminated inflammation about the various joints. In 1865, Marjolin presented to the Surgical Society the femur of a young child dying of measles, which presented all the symptoms of coxitis. Two similar cases are also spoken of by Vallette. During the same year there was a notable discussion in the French Society of Surgery concerning coxalgia, in which Verneuil claimed that measles could not be a direct cause of arthritis, but only so far as it quickly reduced the general condition of health. Ollier held that cold was largely to blame for these lesions, and that all forms of diathesis secondary to fevers appeared to be the result of the susceptibility to cold which all convalescents alike manifest. Matthieu and Strauss would explain these lesions by a tendency to hyperæmia common to all grave febrile conditions. Martin and Collineau regarded hyperinosis as playing an important rôle in the production of these complications. Follin and Duplay consider that the common suppurative arthritis might develop alone under the influence of the general enfeeblement of the constitution by which a peculiar susceptibility to external causes and especially cold was produced.

Measles and scarlatina have, in this matter of liability to secondary infection, so much in common, that it would appear proper to consider them together.

SCARLATINA.

Scarlatina must be recognized as another of the acute infectious diseases, during the occurrence of which suppurative complications may arise. As in the case of diphtheria, to be mentioned, the tonsils and other adenoid tissues are so universally and so early involved that a ready and easy path of infection is afforded. This specific fever bears some resemblance to

dysentery in this respect, that sympathetic infection of serous membrane occurs very often while the occurence of ostitis post-scalatinosa is rare.   It must be said, however, that tubercular joint and bone complications, as well as those of glands, are very common after these diseases, as a careful study of accurate histories of tubercular cases will invariably show.   As was mentioned when considering dysentery, there appear to have been at different times epidemics of scarlatina during which serous or suppurative joint complications were very frequent. For instance, Kennedy, writing in 1843 of an endemic which prevailed in Dublin from 1834 to 1842, spoke of the frequency and malignancy of this complication.   Sometimes a single joint was involved, often three or four of the larger joints filled up with pus, and sometimes even there occurred epiphyseal separation.

In these cases, at least as he described them, the internal organs revealed few, if any, changes.

But to show that this is at least unusual, Bonnet, in his classical work on the joints, stated that the rheumatic complications following scarlatina manifest no tendency toward pus formation, in which respect they were very different from those occurring during or after small-pox. According to Betz, who wrote in 1851, synovial complications of scarlatina were very common, the serous membranes being more or less affected. He took the ground that the implication of the synovia preceded the appearance of the eruption, and was not to be regarded as a secondary manifestation.

Trousseau was the next prominent writer to discuss this complication, which he constantly spoke of as a rheumatism. He described the rheumatic diathesis as affording the explanation to the condition, and said that it involved first the joint, and later the serous membranes like the periosteum and the pleura. Furthermore that it sometimes assumed the most dangerous form, viz., the suppurative, which he likened to the similar condition following the puerperal state.   According to Koren, so-called rheumatoid complications of scarlatina occur in six per cent of cases. Ashby twice saw joint abscesses among five hundred cases of the fever.   Post scarlatinal arthralgia appears to be not uncommon.   The true arthritis

appears to begin in the second or early part of the third week, only exceptionally earlier. A simultaneous implication of tendon sheaths and bursæ has been noted in some cases.

The ordinary form of arthritis appears as a small hyper-secretion of synovial fluid, and the joint may remain sensitive for a long time. It is even possible for the capsule to become so distended that a chronic hydrops results with more or less of flail-joint. Güterbock once saw spontaneous dislocation of the hip in a seven-year-old girl from this cause alone without the presence of pus, and I have seen the same thing. A contrary condition of affairs is sometimes the result of the changes mentioned above. By a combination of hyperplastic thicken-ing of the synovial membrane, along with contraction, there is brought about a shrinkage of the capsule and a fixation of the joint, sometimes in a most undesirable position. I have had, for instance, under my observation, at least two cases of young girls whose knees were almost rigidly fixed in position near a right angle, as result of changes of this kind consecutive to scarlatina. For one of these nothing could be done; the other required open division of all the soft parts excepting vessels and nerves, and including the ligaments, down to the joint.

Trousseau, in speaking of the rheumatic or rheumatoid com-plications of scarlatina, with propriety assigns them a middle ground, as being less serious than those consecutive to typhoid, dysentery and gonorrhœa; but it is unquestionable that primary suppuration does sometimes occur in these joints, which naturally leads to the query whether the scarlatinal poison can give rise to pus. Just what this specific agent is we are not yet certain, consequently do not know whether to regard these cases as secondary or mixed infections. So far as I can learn in such pus none but the ordinary pyogenic cocci have been recognized.

This infection, whether secondary or mixed, is certainly at times excessively rapid. Trousseau relates a case of a young girl seized on one day with extremely severe symptoms, whose wrist was already swollen, red and painful on the second day; on the third day both wrists, a shoulder, a knee and an ankle were involved, and a blowing murmur was heard over the heart; on the fourth day the condition was in every respect

worse, fever was high and on the next morning the child died.
No noteworthy lesions were found in the internal organs, but
all the joints which had been involved were filled with green-
ish yellow pus.   This cannot be regarded as a pyæmic case,
but means rather that the multiple joint abscesses can be
caused by some scarlatinal mixed virus acting directly.   In
this case the disease began with a severe angina, as did it also
in both of Ashby's cases.   This is of interest in connection
with Löffler's experiences.   He cultivated streptococci from
the false membrane of a case of diphtheritic scarlatiniform
angina, pure cultures of which, when injected into the circula-
tion, caused multiple joint abscesses, from which again the
same cocci could be recovered.   Various clinical features ap-
pear to make it evident that the pyogenic infection which
complicates scarlatina is not directly connected with it.   Pene-
tration of pyogenic cocci would seem to proceed through the
affected pharyngeal tissues.   This has been especially insisted
upon by Bokai.   In this respect then diphtheria and scarlatina
stand together, as affording excellent opportunity for penetra-
tion into the body tissues and juices of pyogenic organisms
through the same parts which are so severely involved.   Heub-
ner has described a case of this kind in a fourteen-year-old
boy, one of whose knuckle-joints was first involved, later the
knee, then the other hand, then both lower extremities became
œdematous.   The autopsy revealed purulent infiltration back
of the right tonsil, and an extensive phlegmonous process in
that side of the neck, which had extended to the right jugular
vein and produced an extensive thrombo-phebitis.   There was
also fresh pericarditis.   The joints involved were extensively
disorganized.   In the pus and in the blood were found Löffler's
organisms.   Such a case as this shows how peripheral ab-
scesses may occur pretty directly without necessary interven-
tion of the lungs, since Löffler's experiment showed how they
might involve the joints directly from the circulating blood.

However it is not only for the favorable reception of pyo-
genic cocci that the virus of scarlatina prepares the joints, but
equally well for the disposition and growth of tubercle bacilli.
Volkmann, Bokai and others have shown how directly scarla-
tina appears to lead to fungous complications in the joints,

especially of the non-articular form. This occurs with especial
ease in children with inherited or acquired scrofulous diathesis,
in whom apparently it needs only the impression of the specific
virus to call out whatever latent tendencies they are capable
of exhibiting. So far as bone inflammations are concerned
there should be mentioned in this connection especially the
partial necrosis of the alveolar process, which Salter has so
fully described under the term exanthematous jaw necrosis,
which he met with as well after measles and small-pox. It
affects children between the third and eighth years, and be-
gins with pains in the jaws a few weeks after apparent recov-
ery from scarlatina. Along with discharge of badly smelling
pus a portion of gum separates, and with it one or more teeth
so that the alveolar border is exposed, to be itself exfoliated a
little later. According to Thomas, a similar condition of
affairs takes place beneath the periosteum of other bones, the
manifestations varying very much in time and intensity, ap-
pearing to be due to an exudation beneath the periosteum and
its subsequent breaking down.

Indeed, he regards the majority of cases of necrosis in early
childhood as due to an earlier attack of scarlatina. It appears,
however, that he does not appreciate the frequency of tuber-
cular secondary infection, and the fact that most cases of ne-
crosis are expressions of this condition. The many instances
of disease of the bone, in connection with affection of the
middle ear, consecutive to scarlatina, would appear also to be
of this same general character. Betz has found extensive
purulent destruction of the ribs at various points. Kennedy
has described epiphyseal separation. Graves has seen Pott's
disease of the cervical spine, and Hauff and Hamburger have
observed it in other bones. In his work on General Surgery
Fischer has stated that during the course of scarlatina and
small pox he had observed the most acute and serious form of
inflammation in the bones of the foot, with formation of a
fluctuating tumor, inside of which these bones lay almost
completely loosened from their periosteal and other connec-
tions. He lost three young patients from trouble of this kind
inside of eight to fourteen days. Of course, this is not to be
regarded as the direct effect of scarlatina, but rather as

brought about by a secondary pyogenic infection.   In general
we wish to emphasize that most of the cases of necrosis as-
cribed to scarlatinal poison are really the result of a fungous
ostitis, usually of tubercular character, with consequent caries
or necrosis, the whole being due to easy secondary infection
with tubercle bacilli in ground already poisoned and prepared
by the scarlatinal virus.

Barwell, speaking of the joint complications of the exanthe-
matous diseases, says: "These affections have often, like gon-
orrhœal joint maladies, been ascribed to rheumatism, even
have been termed consecutive rheumatism; but the only point
in their course and condition which at all resembles the rheu-
matic, is that they are nearly always multiple; they possess
neither the temperature of rheumatism, nor the slightest ten-
dency to involve the membranes of the heart or brain."

Barwell states the case about as follows: "The joint affec-
tion following scarlatina tends more often to the suppurative
form, and to produce, if the attack be at all severe, either dis-
organization or anchylosis very rapidly.   The synovitis which
follows measles is, more than any other of these secondary in-
flammations, inclined to fall into the chronic phase after a sub-
acute attack of a few days, and then to give rise to or become
changed into strumous synovitis.   This tendency of strumous
inflammations to follow measles is not confined to joints, but
may also be observed with regard to cervical lymphatic glands,
palpebral conjunctiva, auditory meatus, etc."   *   *   *   "But
sometimes an exanthematous synovitis is empyæmic and pa-
tients die of such disease consecutive to one of the skin fe-
vers, and then the joint affection, considered merely as a symp-
tom, is barely mentioned.   Such mortality only occurs when
the pristine malady leaves behind it some suppurative focus,
such as pharyngeal ulcer from scarlatina, measles or typhoid,
one or two obstinate sores after small-pox, suppuration of the
parotid after mumps, a meso-rectal or meso-colic abscess after
dysentery, etc.   Here the origin of the infection continuing,
the infection itself goes on.   Another, a monarticular form, is
likewise said to occur as a sequel to exanthemata or to dysen-
tery.   This, however, must be extremely rare for all such dis-

eases. I have never seen a case of exanthematous synovitis commencing in a single joint."

Three pretty distinct forms of severe complications of scarlatina have been distinguished: *a*, Common acute serous arthritis, which has often been spoken of as a scarlatinal rheumatism; *b*, a serous arthritis which passes into a suppurative form, and *c*, arthritis which is purulent from the beginning, and is accompanied by the ordinary phenomena of purulent infection. The first form appears usually at the end of the second week, or at or about the period of desquamation; but few joints are involved, the wrist most commonly, and next the knees and ankles. Graves has reported four cases of localization in the joints of the cervical vertebræ. Pains, sensitiveness and swelling are moderate. Bokai has described a subacute form which often leads directly to white swelling, but he thinks, and with reason, that the scrofulous diathesis predisposes to this condition. The second form is regarded by Kennedy Corrigan and others as the more frequent. It begins usually as a small polyarthritis whose attending symptoms, such as fever and swelling, increase in severity as the serous fluid is transformed into purulent. According to Bokai this disease terminates most often in death, or when patients recover they are usually found to have anchylosis of the affected joints. The third form is hardly peculiar to scarlatina, but is met with in various severe infectious diseases. Hebra and Kaposi have described rare cases of purulent arthritis produced by perforation of peri-articular abscesses, and latter these writers have considered these as due to embolic processes, such as are common to phlegmons of the neck, thrombosis in the cervical veins, gangrene of the pharynx, etc. This form is almost invariably fatal.

Babes ("Concerning Septic Processes in Children") has made a most important contribution to the subject of mixed infection. His researches are based upon systematic bacteriological investigation of the material from 112 autopsies on children. The majority of cases were of a septic character following scarlatina, diphtheria or external injuries. The existing agents of the septic infections appear to be less often individual forms than a mixture of two or more species.

Among these the pyogenic and the saprogenic forms were, of course, most common. The latter frequently resembling those from the intestine, appeared to have penetrated into the tissues, and to have there displayed pathological activities.   A third group of these forms was constituted by those peculiarly septic bacteria in the sense in which Koch has described them. Babes has succeeded in cultivating not less than eight of these species (among them the rabbit-septicæmia bacillus of Koch) from the organs of children dying from septicæmia.   Of particular importance is Babes' view concerning the relations of streptococcus pyogenes to scarlatina.   This disease is, according to his view, always accompanied by these cocci, and, indeed, the whole scarlatiniform process may be regarded as a modified streptococcus infection.   The nephritis in scarlatina, for instance, would thus appear to be an invasion of this organ, since it is almost constantly found in the affected kidneys. It is of peculiar interest in this connection to realize that the cocci cultivated from the less acute or more chronic forms of scarlatina evince much less violent activities than those recovered from the more rapidly fatal cases.   In other words, they appear to have a lesser degree of virulence after cultivation on artificial media.

Babes separated a streptococcus septicus liquefians from putrid bronchitis and pulmonary gangrene after scarlet fever, as well as one corresponding to Hauser's proteus, which he found in the lymph spaces of the mucous membrane in a case of dysentery.

Marie Raskin has found streptococci in numerous cases where abscesses have complicated scarlatina.   The pus from these abscesses as well as from the joints was often almost a pure culture of this organism, while in pus from the middle ear, staphylococci and streptococci were mixed.   Streptococci were twice found in the blood of living patients, and twice in that from the cadaver. In 64 cases uncomplicated with suppuration, no streptococci were found in the blood.   Twice out of 18 cases examined streptococci were found in the skin and in the desquamated scales. She comes to the conclusion that streptococci are the active agents in secondary purulent infection after scarlatina; but that they have nothing to do with the

fever itself. She concludes further that the inflamed tissues in the throat are the ports of entry for these infective agents. (*Ctrbl. f. Bact.*, V, 1889, p. 286).

Lenhartz found in a severe case of scarlatina, accompanied by abscesses in the neck and joints, as well as by a diphtheritic condition of the pharynx, a streptococcus, which by experiment upon animals he identified as the streptococcus of erysipelas. (This has been already shown to be identical with the streptococcus pyogenes). He too regards the pharyngeal mucous membrane as the port of entry, and in this case the intense inflammation which it showed he considers to be a modified erysipelas of the mucous membrane; Heubner having already described a genuine erysipelas of the face following scarlatina and diphtheria of childhood. (*Jahrb. f. Kinderheilk.*, Bd. 27, 1888).

TYPHOID.

Although in such masterly works as those by Liebermeister and Murchison, joint and bone complications find no mention as sequels of typhoid, they have long been recognized by surgeons. The names of some of the most eminent surgical writers are connected with the study of typhoid and post-typhoid articular lesions. Boyer, for instance, observed spontaneous dislocation of both thighs after an "essential fever." Post-typhoid hip dislocations have also been reported by Roeser and Stromeyer, by Hueter and Volkmann. The matter of spontaneous luxation and other joint affections subsequent to typhoid, was prominently brought before the Congress of German Surgeons by Gütterbock. While these serious joint disturbances are fortunately rare, some men of large experience having never seen one, they are, nevertheless, common and serious enough to demand recognition, and they have moreover most interesting pathological features. Strange to say, so-called rheumatic affections of joints occur very much less often after typhoid than after dysentery. Still I am sure that many practitioners can recall patients who have entirely recovered from typhoid, who have yet complained of more or less painful joints for some time after. Several of the French

writers have recognized this in the terms typhoid arthralgia and myodynia. It is scarcely necessary to say that a true combination of rheumatism and typhoid occurring simultaneously, is scarcely or not at all to be thought of. Secondly, there is underlying the term post-typhoidal rheumatism, such an impossible condition of affairs as to forbid its use or that of anything equivalent to it. That the mistake is usually made, such a case as the following, quoted by Gütterbock from a report of Simons, will indicate: A patient, æt. 19, suffered from swelling of both ankles, and was supposed to have a severe form of acute rheumatism; not until after due recognition of a typical temperature curve and enlargement of the spleen, and of petechiæ, was it discovered that he was in reality suffering from typhoid fever, and that the joint swellings were merely an unusual manifestation of the typhoid poison.

It is somewhat *singular* that when such serous effusions as those into the pleura and pericardium are generally recognized as possible complications of this disease they should be regarded as so occult when they occur in synovial cavities. Volkmann and Keen have alluded to a polyarticular form of the same condition, which we may call post-typhoidal serous arthritis. Multiple joint abscesses have been more rarely seen, and when present have generally led to or been connected with the pyæmic condition. Nevertheless Gütterbock has reported the following case of recovery from this most serious condition: A young woman was admitted to the hospital at the end of the second week of the typhoid fever, which had been of only moderate severity. During the fourth week there was a hypostatic pneumonia with bloody sputum, and then for several days she had repeated chills. During these there occurred an acute painful swelling of the left shoulder, which improved under the application of ice. The chills continued, and two days later the left hip was similarly affected. Two days later the chills ceased, and she slowly recovered.

A case of Robin's shows how pus may be collected not only in the joints, but in the tendon sheaths and bursæ, as well as in the cellular tissue at some distance. Doubtless such a case as this implies mixed infection, the primary infection being by typhoid bacilli, the second with pyogenic cocci.

Investigations of Brieger and Ehrlich concerning the relation of malignant œdema to typhoid have shown very plainly that various bacteria, which in the healthy body would produce no disturbance at all, find a more or less unresisting organism in the individual whose vitality has been lowered by an attack of typhoid fever. It is not difficult to see then how pyogenic bacteria may penetrate through the intestinal walls or by the air passages, or from the tonsils or teeth, without meeting with that resistance which they would surely encounter in the healthy body. Thus they allude to streptococci which they found in an abscess produced by breaking down of an axillary lymph gland during the course of a fever. According to Brieger, suppurations during the course of typhoid are rare, but Dunin claims to have found them in a fourth of all his patients. He found the pyogenic cocci in all of the cases which he studied, and regards the ulcerated and necrotic patches in the intestinal canal as their port of entry. With everything so predisposing to metastatic infection and pyæmic condition, it is very strange that it has not been more often met with.

Post-typhoidal monarthritis as well as polyarthritis possess great interest for the surgeon, especially when they may run so severe and destructive a course as to lead to spontaneous luxation. One may easily see, indeed, how this subject may possess a medico-legal interest, since, if it occur in a patient already maniacal or delirious, it might lead to supposition of violence on the part of the attendant, which would have nothing to justify it. In fact Schotten has reported a case where such a dislocation occurred while a nurse was raising a child. The best exposition of this part of the subject was made by Roeser, in 1857, who ascribes it principally to distention of the capsule by a fluid effusion from within. In a patient of Stromeyer's, æt. 61, the capsule of the hip-joint was so distended that fluctuation could be easily recognized in the groin. When these dislocations have spontaneously occurred they have usually been at the hip. Very rarely the shoulder has suffered. In fact I believe there are but two such cases on record, one by Meyerhoff, the other by Keen. Keen also has reported one such dislocation at the knee. It is usually

the monarticular form which ends in suppuration, and it is quite possible for functional recovery to occur when such an empyema of the joint is radically treated by incision, irrigation and drainage. In the pus from such a joint typhoid bacilli are sometimes found, but most commonly the ordinary pyogenic forms alone. That more extensive destruction than that of the capsule may take place is illustrated by the case of Weil, in which there occurred not only suppurative coxitis, but a separation of the upper margin of the acetabulum, with, of course, consecutive dislocation of the hip. Fortunately in this case a very useful joint was secured by treatment with traction; which justifies an observation of Bell's that a complication of dislocation with suppuration in the joint was favorable rather than unfavorable.

In 1878 Robin reported a very interesting case of adynamic typhoid fever in which on the eighth day there rapidly supervened a purulent synovitis of tendon sheaths, of multiple periostitis, and finally of suppurative synovitis involving numerous joints. The patient succumbed on the twenty-third day.

It is mostly toward spontaneous dislocation that the non-fatal cases of suppurative arthritis tend. Out of forty-three cases Keen met with thirty spontaneous luxations, twenty-seven of these in the hip, two in the shoulder and one in the knee. Roser was of the opinion that a large proportion of spontaneous luxations in children which were considered as due to rheumatic affections were really of typhoid origin, and Lannelongue has reported three new cases corroborating this view.

The phenomena which precede the occurrence of luxation are variable; for the most part they are symptoms of intense arthritis. On the other hand it does not seem essential that a large amount of effusion should first occur. The explanation of which fact is simple if we admit that the intensity of the disease occurs in the epiphysis and not in the joint. Especially is this the case at the hip when the acetabular side of the joint is involved, and if true, this will explain the difficulty or virtually the impossibility of permanently reducing these dis-

locations, since, as mentioned by Keen and others, they are almost impossible of retention in place.

So far as suppurative lesions in the bones are concerned, our knowledge is very much more recent. Indeed this is almost a matter of the last ten or fifteen years.

Konig mentions in his text-book that he has often seen small abscess in the tibia after typhoid. In a dissertation published in Zurich in 1868, Cerenville mentions inflammation of bone as a sequel. In 1872 Meusel operated with success upon a necrosis of the skull consecutive to typhoid. Paget's papers in 1877 and 1878 were a valuable contribution to the subject. But perhaps the most elaborate paper on the subject came from the pen of Dr. Keen in 1878, who collected thirty-nine cases; but the explanation which he put forward, of thrombosis or of occasional embolism, must lose a part of its force and attractiveness in the light of the bacteriological knowledge of to-day. Still later a French military surgeon, Mercier, brought forward a dozen new cases of bone inflammation during typhoid without the occurrence of sequestra such as Keen had reported. Since then numerous observations have been made by Levesque, Ronda, Gelez, Turgis, Hutinel and Terrillon, and the writer has added his mite to the same subject.

Inasmuch as this topic has been of late carefully studied in its biological aspects we may now say that there is no such thing as post-typhoidal rheumatic affection of bone or joint, but all such cases are to be ranked either as primary or mixed infections, whether occurring in bone or joint cavities, and that while in a few instances the pus therefrom has been found to be almost a pure culture of typhoid bacilli the majority of these cases are genuine mixed infections. With the occurrence of these suppurative foci in these particular structures we must not forget how often they may occur in other parts of the body where they are better concealed or less suspected; and this leads us to the observation, in parenthesis, that no small proportion of patients dying from typhoid fever undoubtedly perish from the presence of collections of pus which, not being recognized, lead to a fatal result by ordinary septic processes. It is scarcely necessary to rehearse in detail

the now numerous cases of sub-periosteal, intra-osteal and intra-articular abscesses following typhoid, whose pus has been carefully studied, and in which typhoid bacilli have been recognized.

Barwell (Chapter IV of his "Treatise on Diseases of Joints") mentions that one of his colleagues, Bellamy, had to excise the hip of a boy, æt. 11, who had suppuration of that joint occurring in the course of a typhoid fever. Barwell further alludes to two different forms of joint abscess; one, which is mostly confined to the hip, is intra-articular, and produces rapid effusion and dislocation. It is usually so painless, or the patient is so apathetic, that the condition is not infrequently recognized only when the patient is convalescent and about to quit the bed, when luxation becomes evident. "The other form is multiple, begins toward the end of the second week, and occasions more suffering; tenderness and pain on movement are especially strongly developed; the swelling is marked by considerable cutaneous redness and peri-articular abscess threatens constantly, yet may disappear; œdema of parts beneath the inflamed parts is strongly accentuated."

All that has been said in previous lectures concerning the peculiar predisposition which the anatomical structure of these parts affords with reference to acute osteo-myelitis, etc., will apply equally well here. The arrangement of the deeper periosteal layer, and the proximity of the epiphyses, have their inviting effect.

Statistics show that in at least two-thirds of these cases individuals are affected during adolescence or in early childhood. Undoubtedly, then, we have to seek for the predisposing causes in the nature of the osseous tissue itself, and we shall find it, as in the case of acute osteomyelitis, very favorably predisposed. It is an accurate general statement to say that during the period of active growth, the very lively circulatory activity of the deeper periosteal layer, and the neighborhood of epiphyseal junctions, predispose to this form of local specific infection. Typhoid ever appears to bear a peculiar relation to the growth of the bone, since it has been noticed that during typhoid fever or after convalescence, there has been an extraordinarily *rapid growth in length, as much even as*

one mm. a day. This is most probably caused by the irritation of the typhoid poison upon the osteogenetic tissue.

In this connection, also, it will be remembered that convalescents suffer from peculiarly active and frequent "growing pains," with frequently a marked tenderness upon pressure in the bones involved. Furthermore, Ponfick, Litten, Orth and Gosselin, have found, in the bone marrow of those dying of typhoid, hyperæmic areas at the points above mentioned, which were almost inflammatory in appearance. Therefore, it is not strange that at these points invasion of infecting bacteria may be most marked, or that when they are thus involved a second pyogenic infection is much easier. This mixed infection must necessarily always lead to abscess formation; but these abscesses are not necessarily confined to bones or joints. Schede (*Munch. Med. Woch.*, 1888, No. 11) has called attention to the suppurations which occur during and after typhoid, in the glands, muscles and in goitrous enlargements, as well as in the osseous system. During one epidemic he saw ten cases of bone abscess; two of these were in the mastoid process, two in the humerus. In the pus from these abscesses he found always pyogenic cocci, but never typhoid bacilli. Several others have shown that recidive of suppurative trouble may occur. They have also shown that the head of the tibia is the most common site of such trouble. Another very curious feature of this subject is that upon which Witzel has laid considerable stress. He calls attention to the relative infrequency of these complications until within a few years; also to the fact that within the past few years the treatment by baths has been much more widely adopted, and he queries whether injuries to the limbs of the patient upon the sides or edges of the bath-tubs, or the sides of the beds, may not have considerable to do with their origin. Such injuries are naturally very slight, but he thinks the irritation may be sufficient to produce a deep abscess.

When these post-typhoidal complications occur, they are much more often acute than chronic. It is possible to have a very acute non-suppurative form of post-typhoidal periostitis, as a case in the writer's practice will show.

This was a young lad of 14, who developed a most intense and painful multiple periostitis during the end of the third week of an ordinary attack of enteric fever. He recovered finally. All the bones of both lower limbs, as well as the pelvis and several vertebræ, were involved.

But a long persisting thickening of the periosteum is very rare.

With reference to the discovery of typhoid bacilli in pus from these sources, it is well to recall what Eberth himself said about their frequency. As a matter of fact the bacilli are most numerous during the first twelve days of the disease, and from that time till the end of the third week they diminish quite rapidly in numbers, and during the fifth and sixth weeks they are only exceptionally to be found. Ebermaier's discovery of quantities of typhoid bacilli in apparently healthy bones of typhoid patients, and especially in a non suppurative periosteal swelling in the same cases, is of very great importance, especially in connection with such instances as that above reported by myself. This author alludes to the similarity in tissue and function between the spleen and bone marrow, and regards it as not at all strange that the bacilli are frequently to be found in the latter. He also succeeded twice in finding the bacilli after incision into a so-called rheumatoid swelling of the periosteum. Such discoveries as this must serve as corroborative evidence of the position taken in Lecture IV, that typhoid bacilli may at times have pyogenic activities, but are not to be regarded as belonging in the obligate pyogenic group of micro-organisms.

It is no harder to think of secondary infection with pyogenic organisms, as the true cause of most of the suppurations met with as post-typhoidal complications, than it is to regard them as secondary but active agents in causing most abscesses in tubercular tissue or in syphilitic gummata. There is another class of lesions met with in these cases where there forms a collection of broken down puruloid material. This must often at least, if not always, in the absence of other organisms, be regarded as the product of a retrogressive metamorphosis, or degeneration of cell elements thrown out to protect against the typhoid bacilli. This form of lesion is frequently met with between periosteum and bone, and it is in such instances that

the bacilli in question occasionally manifest pyogenic activity.
A clearer recognition of the occurrence and clinical course of
these complications would enable one to properly catalogue
them, and not be at a loss to account, for instance, for what
must, at first, appear to be an idiopathic acute osteomyelitis as
a sequel of a severe zymotic disease.

But there is so much to be said in this matter concerning
typhoid alone that, to make such an essay reasonably com-
plete would take more than two whole lectures. I must,
therefore, fall back on my expressed intention of being sug-
gestive only in this rehearsal, and consequently desire to bring
together a few observations of widely scattered investigators,
all of which point in the same general direction. Take, for in-
stance, the fact reported in the *Deutsche Med. Woch.* for 1890,
No. 48, p. 1086, where it is shown how typhoid bacilli have
been found alive in the tissues and capable of active growth
seven months after cessation of the fever.

The investigations of Senger, too, will help to explain mixed
infection after typhoid. A patient died of a post-typhoidal,
acute, varicose endocarditis. In the lesions on the heart
valves there were found no typhoid bacilli, but quantities of
streptococci, which latter were also found in the swollen mes-
enteric glands. Senger regarded the intestinal ulcers as the
ports of entry for the streptococcus infection, remembering
that such invasion of typhoidal ulcers by pyogenic and other
cocci has been often met with, and that Gaffky has found
them often in the mesenteric glands, and in one instance in
various internal organs.

Fraenkel accepts without reserve this possibility of secondary infection, and found
in one case the spleen swarming with "pneumonie-ahnlicher" cocci, which were ex-
tremely pathogenic in guinea-pigs. The invasion occurred after the formation of
dysenteric ulcers resulting from abuse of calomel.

Rheiner observed, in Zurich, during the typhoid epidemic
of 1884, six cases of erysipelas during the course of the ty-
phoid. Two of these were fatal. In the erysipelatous skin
typhoid bacilli were also found.

Foá and Bordoni-Uffreduzzi found almost pure cultures of

typhoid bacilli in the lung juices from the hepatized lung of a typhoid patient dying with croupous pneumonia.

Klebs found typhoid bacilli in the purulent exudate from the pia in a case of cerebral complication of typhoid.

Dunin had numerous opportunities to observe suppuration and phlegmons in various parts of the body after typhoid. He found only pyogenic cocci, and considered that they had in-vaded the tissues *via* the alimentary canal.

Ponfick found in the bone marrow of many patients dying of typhoid numerous changes, and Freund has concluded when the bone is thus involved, as a sequel to the fever, that the af-fection has its origin in the marrow and subsequently spreads to the periosteum. It is likely also that the joint pains of which many of these patients complain are a milder expres-sion of a similar trouble.

A. Fraenkel (*Deutsch. Med. Woch.* 1887, No. 6, p. 101) has made a careful study of the necrobiotic processes which some-times affect the upper air passages of typhoid patients. Wag-ner and Cohn had described a form of angina which they re-garded as a specific manifestation of typhoid. Fraenkel in-sists, and with justice, that if this is a specific angina typhoid bacilli should be found in the lesions; whereas they never have been found. On the contrary, they are secondary infec-tions with other organisms. He shows how exposed to sec-ondary infections these parts are. These changes are much more of a character described by Eppinger as *necrosis epithe-lialis mykotica,* and the staphylococci are mainly to blame.

At the last Congress of French surgeons, in March, 1891, Panas spoke of a case of orbital angioma which of itself is rare, but which in this case presented features of unusual in-terest. The lesion had begun at the age of two, and under treatment had somewhat protruded. Vision remained good until the age of eight when the patient suffered from typhoid fever. She then presented a phlegmonous inflammation of the orbit, which necessited enucleation. He then found a small tumor, deeply seated, which contained pus. This pus was examined and found to contain typhoid bacilli, so that he had to deal with a spontaneous endo-infection of an angeioma by this specific bacillus.

At this last Congress of French surgeons, also, Panas reported that he had met with five or six cases of endo- or secondary infection consecutive to influenza.

Stern and Hirschler (*Wien. Medicin. Presse*, 1888, No. 28) have reported one case of suppurative parotitis following typhoid, in the pus from which both staphylococci and streptococci were found. Also one case of croupous pneumonia in a consumptive patient in whose sputum tubercle bacilli were found. Also a case of puerperal mixed infection, occurring nine days after confinement, along with high intermittent fever, with exudate around the ovaries. Seven weeks afterward the patient displayed a left-sided empyæma which perforated the lung three weeks later. Three days before this perforation streptococci and staphylococci were found in the blood, which must have been invaded from puerperal infection.

Hanot has collected four cases of orchitis during typhoid fever, one of which ran on to suppuration. Liebermeister alludes also to the same thing. It seems also to be a fact that at certain medical stations orchitis is known to follow on a fever whose nature is somewhat doubtful, some considering it remittant and others typhoid. It most often occurs during convalescence, and is often accompanied by rheumatic pains The same is true of ovaritis.

Neve, speaking of abscesses of soft tissue which occur as sequelæ of typhoid, alludes to a minute lesion often found in mesenteric glands, spleen and liver. This, which is of the nature of a localized cloudy swelling, he believes to be infective.

DIPHTHERIA.

Diphtheria belongs also to the maladies which may be accompanied or followed by severe complications in bones and joints. That it is frequently followed by abscess is so generally recognized as scarcely to call for comment here. In this place we intend to allude to those lesions which are produced, perhaps, primarily by the bacilli of this disease, or mainly secondarily by the common pyogenic and other cocci in the shape of mixed or secondary infections. Considering the well-known lymphoid character of the tonsils and neighboring adenoid tissue which is so universally affected in this disease, it is not difficult to trace a possible path of infection and one which is apparently more commonly followed than that origi-

nating in the intestinal canal, and discussed in previous cap-
tions. Here, again, from ignorance or failure to read correctly,
too many of the joint affections consecutive to diphtheritic an-
gina have been regarded as rheumatoid in origin. The
thought comprised within this statement is not intended to be
confused with another that may come at once to the reader's
mind, that in many cases of genuine rheumatic trouble, or
more commonly of gouty trouble, there appears to be a sym-
pathetic infection of the throat or possibly in the muscles of
the neck. It has been widely recognized that, after many of
the more malignant forms of diphtheria have resulted fatally,
multiple abscesses have been found in the liver, the spleen and
the lungs, as well as in and around the bones. This would
betoken a termination by true pyæmic processes, which yet
have not been permitted time in which to produce a secondary
crop of metastatic abscesses in the joints and other organs. No
allusion is intended in this caption, either, to simple œdema-
tous infiltration of the soft parts or limbs, by which a swelling
may be produced in the neighborhood of certain joints, nor
even to a simple serous effusion into the joints themselves.
Such manifestations may be produced at almost any time as
the result of the more pronounced forms of nephritis. These
are not mixed infections in the sense in which we are using
the term, although they cause many local appearances which
might easily be mistaken for those of genuine idiopathic and
rheumatic attack. There are undoubted cases on record
where patients have succumbed to, or have recovered from a
series of multiple abscesses in or around various joints, which
perhaps were of a truly metastatic character, following closely
upon, or occuring during attacks of diphtheria, whose pharyn-
geal symptoms varied in intensity in different cases. Schuller,
in five different bodies of those dying of diphtheria, found va-
rious cocci in the serous effusions or fluid from the joints.
("Transactions of the German Congress of Surgeons, 1884,
Vol. 13).

Fungous inflammation of joints as a sequel of diphtheria is
not rare, as the experience of most physicians will show. As
a rule, it runs an acute course, at least in the beginning, but
usually terminates. after a fashion relatively favorable to the

patient. Perhaps such cases are to be regarded as a confla-
gration by tubercle bacilli, permitted by the well-known low-
ering of vital resistance which diphtheria always produces.

Pauli, in the course of an epidemic of diptheria, observed
twice out of twenty-seven cases a very rare exemplification of
multiple arthritis which he attributed directly to the action of
diphtheritic virus on the synovial membrane. One of the
patients was a lad of fifteen, the other a child of thirteen. The
inflammation involved nearly all of the joints, including even
the temporo-maxillary and costo-sternal. Although both
patients recovered the articular complication lasted for a long
time. The clinical findings in that one of his cases in which
one of the temporo-maxillary joints were involved, along with
others, suggest to the writer the possible explanation of some
of the complications of diphtheria and scarlatina, in which the
source of the principal local infection is in intimate relation
with this joint. While I have no data at hand to show that
this is exactly the case, yet it is not difficult to understand
how, from an infection of one of these joints, metastatic com-
plications might very easily occur, to say nothing of the
anchylosis of the jaw which is known to sometimes result.

Septic Angina.

For some years certain authors have referred under this name
to a complex pharyngeal disease which seems to lead so rapidly
to a fatal result as to make us think that we have to deal in
such cases with a veritable septic intoxication. Verneuil and
Landouzy have reported interesting observations on this sub-
ject, and have remarked upon the inter-relations betwen these
lesions and articular or renal symptoms. Lapersonne reports,
for instance, the case of a man previously healthy who, fifteen
days before the appearance of phlegmonous angina, had suf-
fered from a large ulceration in one tonsil, and who evinced
exophthalmus and severe cerebral symptoms. He died shortly
after and the autopsy revealed the existence of a suppurative
phlebitis of the ophthalmic veins and the dural sinuses.
Apropos of the cases of angina which accompany albuminuric
nephritis, Landouzy asks if the tonsils may not furnish a port

of entry for such infection, since it is of course well-known that this complex sebaceous organ, developed upon a mucous basis, is in intimate relation with lymphoid tissue and lymphatic vessels. Other French writers have reported such cases as the following, for instance: A suppurative arthritis of the wrist consecutive to an infectious pharyngitis, which had been regarded at first as a case of glanders. Puncture revealed only the ordinary bacteria, and inoculations upon animals produced no septic lesion. Another case of very severe angina accompanied by high fever in a patient who some days later was seized with intense pain about the wrist, followed by signs of very severe local infection. A little later peculiar phenomena appeared about one knee. He fell into a typhoid condition, was delirious at night, and his condition gave rise to the greatest alarm. Free incisions were made, and antiseptic irrigation practiced, with good result.

It has happened to me in my own practice to see one case of very serious cynanche tonsillaris, with accompanying suppuration in and around the tonsil and pharynx, where we stood ready for hours to make tracheotomy for relief of threatened suffocation, in which an extensive abscess developed about one knee, with two smaller ones near the lower part of the leg. This was before pus had ever been studied bacterologically, so I can say nothing further about it than that it offers probably a case of secondary infection,

MUMPS.

The infectious character of mumps is probably not questioned to-day. Its contagious and epidemic characteristics compel its classification along with the general infectious diseases. Capitan and Charrin even claim to have cultivated its microbe, to which they ascribe specific properties, although their claim is not yet generally recognized. They have found it, in the blood and saliva, as a bacillus two to three micromillimeters long, very motile and capable of cultivation, but they cannot reproduce the disease with it.

In the course of this disease, as in that of other infectious diseases, we frequently observe various pathological manifesta-

tions, while orchitis, ovaritis, stomatitis, enlargement of the
tonsils and spleen, and albuminuria are most commonly asso-
ciated with it.   Articular or peri-articular complications
have been noted by several writers.   Thus in 1850 Rilliet re-
ported the case of two brothers whose attacks of mumps were
rapidly followed by what he described as acute rheumatism.
Later Begeron reported a case of bursitis of the præpatellar
bursa. In 1877 Gailhard cited two cases; the first a soldier æt. 21,
who had double parotitis on the right side, epididymitis with in
tense headache, and arthralgia; the second a sailor whose ankles
and wrists were seriously involved during convalescence from
mumps.   Jourdan watched an epidemic of mumps in a battalion
of chasseurs.   Four of them were, toward the end of the dis-
ease, seized with severe articular pains in various joints for
which they asked their discharge from service.   Boisset pub-
lished under the term pseudo-rheumatism the case of a soldier
recovering from a mild attack of the mumps, who, about the
twelfth day, was seized with severe pains in many of the joints,
which a little later seemed to localize themselves in the sheaths
of the common extensor of the fingers, in the extensor of the
index finger and the extensors of the thumb of the right hand.
The tendons were also apparently involved, the pain was more
severe at night and increased by pressure or movements.
There was no particular change for eight days, then rapid
amelioration for three days, after which relapse occurred.
Hydrarthrosis of the knee also appeared; finally the patient
completely recovered.

INDEX OF SURGICAL PROGRESS.

CHEST AND ABDOMEN.

I. On the Diagnosis of Carcinoma of the Pancreas. By DR. N. MUSINECI (Naples, Italy). The writer concludes as follows:

1. The diagnosis of carcinoma of the pancreas is difficult in the majority of cases, as it is most easily confounded with neoplasms of other organs.

2. Diagnosis by exclusion is the best method of diagnosing disease of the pancreas in general, and carcinoma in particular.

3. Icterus is present from the beginning of the disease. The presence of a tumor, which site corresponds to that of the pancreas, the finding of fat in the fæces and sugar in the urine are facts of great value in the majority of cases in making a diagnosis.

4. The presence of these signs, although of great diagnostic value, does not enable one to determine the primary origin of the neoplasm, as the transmission of cancerous nodules from one organ to another is the rule, and we have no means of knowing whether the pancreas, liver or stomach were primarily affected.—*Gazzette degli Ospetali* 1890, Nos. 81, 82 and 83.

II. Chylous Ascites and Carcinoma of the Pancreas. By DR. SANTI FLAVIO (Turin, Italy). All writers agree that the diagnosis of carcinoma of the pancreas is a matter of great difficulty. Prof. B. Mugnai in a recent mongraph on the pancreas, (Collezione ilaliane di letture sulla medicina, series v, No. 9.) says that the diagnosis of this affection is "most difficult and rarely possible." Dr. N. Musineci, in a communication which appeared in the *Gazzette degli Ospetali*, Nos. 81, 82 and 83, 1890, came to the conclusion that a diagnosis in the majority of cases is hardly to be made, and that diag-

nosis by exclusion is the best method. Icterus, the presence of the tumor corresponding to the site of the pancreas, fat in the fæces and sugar in the urine are the most important symptoms.

The writer calls attention to a symptom as yet unobserved in this disease, namely, the presence of chylous ascites. Among 3,233 cases treated from 1883–89 in the *Ospedale Maggiore di San Giovanni* in Turin, Italy, there were only two cases of carcinoma of the pancreas. Both of these were accompanied by chylous ascites; this special form was not observed in any other case. Hence, the writer does not regard it as a mere coincidence, but would explain its presence by the contiguity of the head of the pancreas with the thoracic duct, which passes behind this gland and along the vertebral column. An abnormal development of the pancreas would cause it to press upon the thoracic duct and consequently lead to its rupture and the passage of chyle into the peritoneal cavity. Rupture is not a necessary consequence as extravasation might also take place by diapedesis.

It would seem strange that a symptom so constant in these two cases should have been overlooked as yet by all observers. The writer is quite certain that it must have been present in many cases of cancer of the pancreas and yet passed unobserved. Ruggi (*Giornale internazionale di scienze mediche,* 1890) reports a case in which he noted the presence of ascites, but he speaks of this as of minor importance. In such cases the ascitic fluid might be largely serous and require the microscope to reveal the fatty globules.—*Gazzettae degli Ospetali,* No. 11, p. 84, 1891.

III. **A New Method of Suturing the Intestine, with Exact and Rectilinear Apposition of the Margins.** By Dr. D. Morisani (Naples). The writer has devised a method of suturing the intestine which promises to overcome the disadvantage of Lembert's suture, namely, of the rolling in of the line of sutures. He proceeds as follows: The entire mucous layer of the cut and flattened end of the intestine is so seized with a clamp that its entire circumference, after it has been slightly drawn out, may be clipped at one cut with the scissors. This is easily done if the small intestine be not dilated.

If this be the case then a narrow ring of mucous membrane must be excised with the pincette and scissors. By this process one obtains a margin composed only of the serous and muscular layers, while the mucous stratum lies a few millimeters within the intestinal tube. The margins are then apposed; the needle is so introduced through the serous layer, that the puncture comes to lie two or three millimeters behind the line corresponding to the margins of the mucous layer. The needle then passes obliquely on through the muscular layer to penetrate the layers of the opposite tube in the contrary direction, viz., muscular and serous layer, and appear beyond the line of the mucous layer. Sutures are then introduced in the above way around the entire circumference of the intestine at a distance of three millimeters, one from the other. They are then tied. Care should be taken that the muscular layer lie against muscular layer and the sutures only be drawn tight enough to bring one mucous layer in contact with the other. Exact contact of the mucous margin sutures secures the sutures against infection. This single row of sutures is sufficient to closely coapt the margins; supplementary sutures in the serous coat are unnecessary, as the surfaces of the wound lie well and broadly against each other. The writer cites three cases of incarceration of the intestine treated by resection, which, as regards the intestine, had an uneventful course.—*Il Progresso Medico,* 1889.

<div align="right">F. H. Pritchard (Boston).</div>

IV. A Case of Ileo-Cæcal Intussusception in an Adult Treated Successfully by Laparotomy and Reduction. By Norman Dalton, M.D. (London), and W. Watson Cheyne, F.R.C.S. (London). A woman, æt. 26, suddenly began to experience attacks of sharp abdominal pain, recurring about twice an hour and with most of them she vomited a greenish material. During the day the bowels opened freely. Upon examination, a slightly tender, sausage-like mass was felt in the right iliac fossa. On the following day the attacks were less severe and more infrequent, due to opiates, but she had passed two large pultaceous motions, consisting chiefly of blood, partly dark and partly red.

The tumor was now very evident, cylindrical, about as thick as a German sausage, and about three inches long; it lay in the right iliac fossa, with its long axis directed upward and to the right, but it was freely movable, and could be shifted into the right lumbar region and also into the umbilical region. It was slightly tender although palpa tion over all other points in the abdomen was entirely painless.

Intussusception having been diagnosed, abdominal section was performed, an incision three inches long being made in the middle line from a little below the umbilicus downward. The peritoneal cavity having been opened, the tumor, which was very freely movable, was found to be an ileo cæcal invagination, and a cautious attempt was made to pull out the invaginated portion. As this was not successful, the incision was enlarged sufficiently to enable the hand to grasp the tumor. There was then no further difficulty in squeezing out the invagination. The wall of the affected portion of the gut, especially of the cæcum, was much thickened by inflammatory exudation, but though the peritoneal surface was dull there was very little lymph on it. Without washing out the peritoneal cavity, the wound in the peritoneum was closed by a continuous catgut suture, and the muscles and skin brought together by interrupted sutures, over which antiseptic dressings were applied. The patient reacted well. Milk diet with a grain of opium every four hours, was continued for but two or three days , after which under an increased diet, she progressed rapidly, having a free movement of the bowels after an enema about a week later, on which day the wound was found to be healed. The patient was discharged cured 20 days after admission.

Dr. Dalton remarks that the patient attributed the attack to great nervous excitement and depression produced by a domestic quarrel, and expresses his belief that the emotion may have affected the abdominal sympathetic in such a way as to cause the irregular intestinal contractions to which intussusception is due. The frequency of in- tussusception in children, who are obviously emotional subjects, and its rarity in adults, when not due to polypi, tends to strengthen this theory. It is worthy of note that after the wound was sewed up, the tumor could still be felt through the abdominal wall almost as dis-

tinctly as before the operation; this was due to the thickening of the wall of the gut by congestion and exudation, not a recurrence of the invagination.—*London Lancet*, Nov. 29, 1890.

V. A Case of Successful Laparotomy for Acute Intestinal Obstruction. By EDWARD J. CAVE, M.D. (Crewkerne, Eng.) A man, æt. 55, was suddenly seized with severe abdominal pain and vomiting. This continuing and the bowels failing to move, soap and water enemata were tried ineffectually. Palpation of the abdomen revealed nothing. On the following day the conditions still persisted, the vomiting becoming stercoraceous. Accordingly, the abdomen was opened by a median incision, 3½ inches long. A part of the small intestines were seen to be distended and dark, while others were empty; tracing up the empty coils for a few feet, a strangulation was quickly found, consisting of a firm tough cord, about an eighth of an inch in diameter, attached to the inner aspect of the umbilicus, and passing downward and backward, its deep attachment not being determined; this band lay over the small intestines, tightly strangulating it against the posterior abdominal wall. It was divided on a flat director, when the gut immediately sprang up with a sharp indentation on its anterior aspect, where the cord had constricted it. The bowel was in that vicinity of a dark maroon color, with a slightly granular surface. The peritoneum contained a considerable quantity of dark blood-stained serum, which was washed out with a gallon or two of hot water poured from a large jug, and the wound closed in the ordinary way with interrupted sutures of chromic gut and dressed with protective, a layer or two of wet gauze, and a pad of sublimated wood wool, supported by strips of adhesive plaster. The convalescence was delayed a little until, on the sixth day, rectal injection produced a copious fæcal discharge. The wound was dressed first on Tuesday, and next three days later, when the wound was found to be quite well consolidated. Two days later he got up. The constricting band appeared much as if it might be the remains of the vitelline duct, and if such was the case, the lumen was obliterated.—*London Lancet*, Dec. 6, 1890.

VI. **Intestinal Obstruction Caused by Tumor; Ileos-tomy; Disappearance of Tumor; Subsequent Enterorrha-phy and Recovery.** By J. GREIG SMITH, F.R S.E. (Bristol).   The fact of a solid abdominal tumor of considerable size disappearing spontaneously after abdominal section makes so great a demand upon the reader's credulity that the author relates this case with the fullest detail.   A man, æt. 25, had felt pain in the hypogastrium for seven weeks, during which time he had suffered frequent attacks of vomiting. Examination of abdomen showed a dull area measuring two inches in diameter, a little above the left anterior superior iliac spine; in this dull area, a hard mass could be distinctly felt, but, on account of the abdominal distension and the muscular rigidity, could not be fully pal-pated; it could just be felt by the finger in the rectum.   It becoming evident after a few days' careful observation that intestinal obstruction from pressure was rapidly coming on, as a result of the tumor, lapa-rotomy was performed by an abdominal incision, beginning $1\frac{1}{2}$ inch below the umbilicus, and 2 inches long; the parietal peritoneum was thickened and vascular, chiefly toward the left.   Occupying the left side of the abdomen, and extending from the pelvis upward toward the umbilicus, was a hard rounded tumor as large as a cocoanut, to which several coils of small intestine were firmly adherent.   The growth was fixed below and could not be moved from its position.   The abdomi-nal opening being dragged to the left the growth was exposed to view, and was seen to be covered with thickened peritoneum of a dusky hue and with large vessels coursing over it.   An aspirator or needle inserted into its substance showed it to be solid, the puncture bleed-ing rather freely.   A piece of distended ileum as close to the tumor as possible was pulled to the surface and fixed to the abdominal wound, with a view to subsequent opening.   Fixation was made by two sutures passing through the parietes and outer coats of the bowel, and fixed to strapping at the sides of the wound.   There was no su-turing of parietal peritoneum to the skin, and no sutures were placed in the incision beyond the two, which also passed through the outer coat of the bowel   The wound and the patient did well, so that on the third day after the abdominal section, the gut was opened and a

No. 8 celluloid catheter bent in hot water to a sigmoid curve was passed into its lumen, an India rubber tube attached to its outer end conveying the intestinal contents into a bottle placed by his side. The bowel was firmly adherent to the parietes, and there was no fouling of the wound by escaping fluids during the opening of the bowel. The free escape of fæces through this opening soon relaxed the abdominal walls so that the tumor could readily be palpated; it was perfectly solid, globular in shape, nearly as large as a child's head at birth, and had a macroscopic characteristic ordinarily associated with sarcoma.

The patient from this time reported at occasional intervals, during which time the discovery that the tumor was gradually diminishing in size occasioned great surprise. And about a year later it was finally found to have disappeared altogether. Five months later the fæcal fistula was closed by an enterorrhaphy, during which the fingers inside of the abdomen could find no trace of the tumor.—*London Lancet*, March 21, 1891.

VII. Surgery of the Appendix Vermiformis. At the meeting of the Clinical Society of London, February 13, 1891, several interesting reports involving the surgery of the vermiform appendix were made.

HERBERT W. ALLINGHAM, F.R.C.S. (London) reported a case of a boy, æt. 15, who complained of internal pain in the abdomen, which he attributed to a fall the day before; the temperature was 100 6° F., pulse rather feeble, tongue furred and a little dry, the abdomen below the umbilicus was tense and tender, but not to any extent, but there was no marked tenderness, fullness or pain over the cæcal region. Catherization obtained clear and bloodless urine. The symptoms being rather obscure, an exploratory median abdominal incision was made; on opening the peritoneum pus welled up into the wound and there were evidences of commencing peritonitis. The intestine not being found to be wounded attention was at once turned to the cæcum and appendix; the latter was observed to be closely adherent to the former and to be perforated by a ragged ulcer and by it were two fæcal concretions. The appendix was separated from the gut, liga-

tured with firm silk at its base and cut away ; there were no evidences of previous inflammation about the cæcum. The abdomen was carefully washed out with war.n water, glass drainage tube inserted, and the abdomen closed with silkworm gut sutures. Patient made a complete recovery after a prolonged convalescence.

J. BLAND SUTTON, F,R.C S. (London), reported four cases: (1) A man, æt. 24, presented unmistakable signs of appendicitis. A lateral incision exposed the appendix lying adherent to the anterior aspect of the cæcum; its middle third had sloughed forming an abscess containing several ounces of pus. The appendix was removed, the stump sutured and the peritoneal cavity flushed with warm water, the patient making an uninterrupted recovery. (2) A man, æt. 22, came under the author's care as a case of renal colic. He had had three attacks previously, the first, two years ago, diagnosed as typhlitis and the second as ruptured muscle. Careful examination showed the disease clearly to be "relapsing appendicitis." The cæcum was exposed by a lateral incision and the appendix found to be slightly adherent to the brim of the pelvis, filled with pus and with its lumen obstructed. The appendix was cut off, the end carefully sutured, the muscles drawn together by gut sutures and the skin closed in the usual manner. The patient left the hospital convalescent on the four teenth day. (3) Another patient supposed to be affected with renal colic; upon examination under chloroform, was diagnosed to be a case of post-cæcal abscess, probably secondary to inflammation of a vertical retro-cæcal appendix. Abdominal section revealed an appendicis lying vertically behind the cæcum, with its middle third sloughed. The pus was washed away, the stump of the appendix sutured and a drainage tube inserted. The patient left the hospital convalescent. (4) A man, æt. 19, had typical signs of typhlitis, and the presence of pus became indicated; a lateral incision gave exit to a large quantity of pus from the iliac fossa; the tip of the appendix had sloughed. As the rest of the appendix was dilated, it was cut off, its end closed by three gut sutures and the wound stuffed with iodoform gauze. On the eighth day a small fistula formed in the colon, allowing gas to escape, but this became closed as the wound cicatrized, and the patient left convalescent.

Three of these cases were examples of acute and one of chronic re-lapsing appendicitis and all illustrated the importance of early opera-tion.

FREDERICK TREVES, F.R.C.S. (London), remarked that the "medi-cal" treatment of typhlitis was successful in many cases and to treat all these cases surgically would only lead to disaster. The great ma-jority of cases which had come into the London Hospital during the last ten years had recovered under medical measures, and there was no doubt that the epidemic of removal of appendices which had pre-vailed in some quarters had been extreme. If mere acuteness of symptoms were a guide to operation, many cases would be dealt with where no disease of the appendix would be found; on the other hand, he had known of cases where the patients had continued at their work until the bursting of the appendix. A very valuable means of distin-guishing diseases of the appendix from trouble in the cæcum was ex-amination per rectum, from which position it is often easy to distin-guish the outline of the appendix. Then again reflex pain in the testis or in the neck of the bladder should be looked for, the frequent appo-sition of the appendix to the ureter being remembered. Though in some cases early removal should be demanded, yet, in many meddling would be disastrous. The use of needles for exploration is bad practice and it has yet to be shown that operative interference before the third or fourth day is ever called for. With regard to the fatality of reported attacks, he has seen patients who had suffered twelve or even twenty attacks. He has seen a number of cases where destructive inflamma-tion had led to a spontaneous cure. The greatest care should be ex-ercised in the selection of cases of relapsing typhlitis to be operated upon It might be found impossible to remove the appendix when cut down upon, as has occurred in his experience; on one occasion a removal took him more than an hour. The ureter lay curved and twisted in the region of the appendix and he was sure that some day, a piece of that tube would be removed by mistake. The normal po-sition of the appendix is behind the cæcum, it frequently lies in a ver-tical axis and trouble in it is a well-known cause of perinephritic ab-scess. He had known the pus extend up even to perforation of the

diaphragm. In spite of every precaution, yielding of the cicatrix at the seat of operation is exceedingly common, and a method of suturing the abdominal wall to prevent this has yet to be demonstrated. It is wisest to make the abdominal incision over the adhesions and not into the peritoneal cavity and from there into the abscess; the former is a little more tedious but decidedly the better practice. After opening the abscess, the less that is done the better, beyond putting in a drainage tube; certainly the results have been best where the interference has been least, and, even if a fæcal fistula results, it should be remembered that in this region, they frequently undergo a spontaneous cure. In many cases approximation of the serous surfaces is impossible and, where the operation is done in the absence of pus, the stump should be fixed to the neighboring peritoneum.—*London Lancet*, Feb. 21, 1891.

JAMES E. PILCHER (U. S. Army).

VIII. Upon Median Abdominal Hernia. By DR. O. WITZEL. Witzel gives a very valuable contribution, based upon his experiences at the Bonn clinic, upon the subject of herniæ occuring in the linea alba. The ages of the patients varied from 30 to 50 years. According to Witzel about one half of cases of this variety of hernia are to be referred to a traumatic origin; the trauma consisting in most cases either of a violent strain or a forcible backward bending of the body. In other cases it may occur without this factor, the fatty tissue in the cross-meshes of the linea alba undergoing absorption in connection with emaciation, openings occurring in this manner into which, during an effort at vomiting for instance, a hernia may be crowded.

Median abdominal herniæ are usually of a mushroom shape, the broad portion of which is made up of a somewhat heavy layer of sub-peritoneal fat. This is forced through the opening in the area of the linea alba by intra-abdominal pressure and together with its attached peritoneum forms a funnel shaped investment for the hernia proper, although it not infrequently occurs that the sac thus formed, and which has been demonstrated a fatty hernia, remains entirely empty, or may be found to contain in conjunction with an increase in

size of the tumor most commonly a process of adherent omentum; next in frequency intestine is found within the sac of this variety of hernia, and more rarely still a portion of the stomach wall. In a case quoted from the Bonn clinic there existed three median herniæ; the first was found to be empty, the second contained omentum, while the third was occupied by a loop of intestine. In another case of hypogastric hernia the parts about the hernial passage were completely adherent to the summit of a loop of small intestine.

The symptoms of the variety of hernia under consideration are those of pain, principally. This is not confined to those cases in which the hernia consists of omentum or intestine, or both, but is found to be an almost equally prominent symptom in cases where only an empty sac is present. In addition there are present gastric symptoms and nervous disturbances. As the affliction is quite liable to be mistaken for internal affections, frequent examination of patients complaining of these symptoms should be made with reference to this condition. This examination should not only be made with the patient in the dorsal decubitus, but in the upright position as well, with the body bent forward, and at different times following a meal. In view of the fact that instances are recorded in which diseased conditions of the stomach and duodenum were present in connection with median abdominal hernia, this should not be overlooked.

The most rational and successful means at our command for the treatment of this variety of hernia consists of radical operation. After isolating the fatty covering of the hernial tumor back to the hernial opening, the hernial sac is cleared of this and opened, any adhesions present are loosened, and after emptying the sac, the edges of the opening are closed by suturing together the abdominal walls, which latter have been previously prepared by sliding the one over the other until considerable overlapping is obtained. In case of very large hernia, the author favors the method of gathering up several folds of its peritoneum constituting the sac and suturing this to the abdominal side of the ring, somewhat after the manner of MacEwen. In strangulated median abdominal hernia an incision is to be made in the neighborhood of the hernial tumor, and the abdominal cavity entered through

this. The obstruction to the return of the hernia may be dealt with, as well as the condition of the intestines ascertained, through this same opening.— *Saml. Klin. Vortr.*

G. R. FOWLER (Brooklyn.)

IX. On the Treatment of Strangulated Hernia when the Intestine is Gangrenous or Ulcerated. By C. B. LOCK-WOOD, F.R.C.S. (London). The communication is based on the analysis of cases of hernia, in which the intestine was gangrenous or ulcerated, collected from the records of St. Bartholomew's Hospital, and upon the details of two others in the author's own practice. The Bartholomew's cases were treated in the manner laid down by Sir William Lawrence, namely, "by a free incision of the mortified part, in order to unload the distended intestinal canal; or, if the gut should have already given way, to divide freely the integument and sac; and to leave the subsequent process of cure entirely to nature," the stricture being also divided, if necessary, for the proper flow of fæces. Four of the thirty five Bartholomew's cases recovered, three of them completely; one had a fistula eight months after the operation. These patients only recovered after-repeated operations, and the details of their cases are given. Thirty-one (88–57%) of the Bartholomew's cases died, and both of the author's One of the latter had no proper relief from the opened bowel, although there was a free passage, and the other fatal cases show that this is not at all unusual. The causation of the absence of relief is discussed and illustrated with cases, and the conclusion is arrived at that the usual operation cannot be depended upon to give relief. Next the other causes of death are examined into, and it is shown that intra peritoneal or subperitoneal fæcal extravasation may occur, or that the gangrene or ulceration may continue to spread to the bowel within the abdomen, or septic peritonitis may spread from the sac to the rest of the peritoneum. Should these dangers be escaped, the patient is in danger of dying of inanition. All of these accidents are illustrated from the list of cases. The alternatives to performing the usual operations are next given, and the statistics of treatment by clamp, secondary suture, and of primary resection and

suture are mentioned.   The conclusion is in favor of primary resection
and suture, and the rationale of the procedure is briefly described.—
*Proceedings of the Royal Med. aud Chirg. Society, 1891, Author's
Abstract.*

   **X.   Radical Operation for Hernia in Billroth's Clinic
from 1877 to 1889.**   HAIDENTHALLER.   Between the years 1877 and
1889 there have been 136 herniotomies performed in the clinic of the
great Vienna surgeon.   Of these 93 were radical operations performed
upon 89 patients, and 5 were cases treated by Schwalbe's method of
alcohol injection.

   The operative procedure usually followed was that of Czerny.   In
40 cases, however, the suture of the abdominal ring was accomplished
by means of silk, instead of catgut, as in the original Czerny operation.
Another departure from the latter consisted in permitting the neck of
the sac, after ligature, to remain *in situ*, instead of returning it to the
abdominal cavity.   In 8 cases the sac was cut away and the peritoneal
wound sutured; in 3 cases the neck of the sac was closed by means of
a purse string suture.

   Excluding the fatal cases, as well as 4 operated upon after Macewen's
method, and several others which it was found impossible to follow up
accurately, of the remaining 78, primary union occurred in 39 with an
average time of healing of 20 days; in 38 cases cicatrization or secon-
dary union secured with an average duration 45.8 days of healing.   In
crural herniæ it was found that there was much less tendency to dis-
turbance of the wound course.   In fact, the proportion of those which
healed by primary union, among crural herniæ, was double that which
was observed as uniting by secondary union.   In all herniæ the extra-
ordinary fact was observed that those operated upon in a non-strangu-
lated condition exhibited a much longer duration of the course of heal-
ing than in strangulated hernia.   In the cases in which the hernial sac
was extirpated, union by first intention occurred rather less frequently
than those in which this was left *in situ.* In those cases in which partial
extirpation of the sac was performed, the after course of the wound
was somewhat complicated by the occurrence of sloughing of the re-

mains of the latter. The mortality of those cases studied with special
reference to the question of radical cure, and excluding those in which
the operation was complicated by conditions not necessarily entering
into the question (strangulation, etc.), amounted to 6.25%. Peri-
tonitis and septicæmia entered largely into the causation of the cases
which perished. Up to the time of the publication of the paper, 34
cases could be traced and studied with reference to the final result.
In 10 cases, and these were herniæ of considerable size, relapse had
taken place; in the remainder, the cure seemed to be permanent. This
favorable showing, the author declares, may be still further invalidated
by subsequent relapses. It was observed that in only 4 instances did
the relapse occur soon after the operation; in the majority of cases this
occurred later on (three times in the first year; three times in the fifth;
and in one case in the sixth year.) An interesting point relating to
the suturing of the ring is observed: As a result of the study of his
own cases, in connection with those of Leisrink and Anderegg, the
author concludes that in the inguinal herniæ of females first, and next
those of males, the best results are obtained when the opening is
sutured. On the contrary, in crural hernia, in both sexes better re-
sults are obtained by not suturing the ring. In all cases it was ob-
served that a longer time elapsed, upon an average, prior to recur-
rence of the hernia, in sutured than in non-sutured cases. It was not
considered that extirpation on the one hand, or preservation on the
other, of the hernial sac exercised any influence upon the final result.

Judgment is reserved regarding Macewen's operation, inasmuch as
experience with the same is still limited. The opinion is advanced,
however, that it will be found too complicated for general adoption,
and that the process of loosening the sac without removal of the same
leads to disturbances of wound healing. In the four cases operated
upon it was found that the loosened sac, either in whole or in part, was
thrown off.

The subcutaneous injection of alcohol is looked upon with but
slight favor in Billroth's clinic. Brilliant results promised at first in
this method, but subsequent experience and the final results of those
operated upon did not fulfill the early hopes entertained. In all cases

there formed solid masses of inflammatory infiltration which closed the hernial opening. These, however, soon became absorbed, and recurrence took place, in one instance at the end of fourteen days.

There are many interesting points, both of an anatomical and clinical character, brought out in the paper, not among the least of which are the observations relating to the causes which operate to favor a recurrence of the hernia. The author considers that the bringing about of a normal condition of the peritoneum is of greater importance than the closure of the hernial opening, although the latter is not to be neglected. In passing he calls attention to the necessity of employing the heaviest silk in closing the ring, believing that this favors the formation of more solid cicatricial tissue. The occurrence of this latter alone can only act as an adjuvant, however not preventing but simply deferring the final recurrence. A glance at the cases of crural hernia, in which sutures were not employed, will reveal the fact that the omission of this heretofore considered important point in the operation produced no unfavorable influence upon the final result.

Stress is laid in considering the technique upon the importance in those cases in which the sac is not easily loosened, of permitting this to remain *in situ*; but should this latter course be deemed advisable, the division of the neck of the sac should never be omitted. The manipulation of the parts and the injuries inflicted upon the tissues by this as well as tearing the sac loose with the fingers, is to be avoided.

In contrast with the experience of the Billroth clinic, attention may be called to the recent utterances of Lucas Championniere upon the mortality following efforts to bring about a radical cure of hernia, in cases in which this consideration alone is brought forward (cases of uncomplicated and non-strangulated hernia. From May, 1887, to May, 1889, there was operated at the Hospital St. Louis, in Paris, 103 operations upon cases of this character, without a single fatal case. (*Bull. et mem. de la soc. de Chir. de Paris*, T. xv, p. 636). This favorable showing is attributed to the employment of the most stringent precautions of an aseptic character.—*Archiv. f. klin. Chir.*, Bd. xl, p. 493-535.

G. R. FOWLER (Brooklyn)

GENERAL SURGERY.

I. Upon the Possibility of Infection Occurring Through a Superficial Suppurating Surface. By Dr. Leone Sestini (Italy). The author made a series of experiments upon animals for the purpose of determining the susceptibility of superficial suppurating surfaces to infectious influences. Rabbits were employed; 17 of these animals in whom a superficial wound surface was produced were inoculated thereon with staphylococcus pyogenes aureus, and 3 with staphylococcus pyogenes albus. Suppuration of the surfaces having been by this means established, S. proceeded to inoculate the surfaces by means of anthrax bacillus. For the purposes of a control experiment 8 other rabbits were inoculated in the usual manner by means of the same bacillus. Of those animals inoculated upon surfaces, the site of a suppurative process, not a single one manifested symptoms of the disease, while the other group very promptly died of the inoculation. The same results were obtained in the use of the virus of chicken cholera. In the case of the inoculated bacillus it was found that no general infection occurred, although extensive local ulceration followed. This latter was not as extensive as in the control animal, although in other respects the behavior of the two animals were quite similar.—*Riforma Med*, Feb. 28, 1890.

Geo. R. Fowler (Brooklyn).

II. Case of Cyanomycosis. By Vasily L. Jadkevitch (Novgorod-Seversk, Russia). The author records an interesting instance of what he thinks to be Charrin's *maladie pyocyanique* in man, caused by the *bacillus pyocyaneus* (that is, by one of the microbes of "blue suppuration"). The case refers to a generally healthy and robust gentleman, at present æt. 60, who, for many years past, had been suffering from chronic dry eczema of both of his legs. In February, 1880, during a long and tedious journey, the rash assumed a "weeping" character, to rapidly transform into large ulcers, profusely discharging pus of a quite blue color. Under the influence of some treatment in June, the blue suppuration gradually ceased, after which the ulcers healed. A month previously (in May), however, without

any apparent cause, there developed an ascending paresis of his right upper extremity, both motion and sensibility being affected.   Electricity having been resorted to, a complete recovery soon ensued. About the end of 1885 there occurred another attack of "blue suppuration" (in the same situation), which lasted about three weeks, and was followed this time by general prostration; dyspnœa and strikingly quickened pulse (140 per minute), some cardiac weakness and emaciation.   In about four months the train of symptoms slowly disappeared.   The patient remained perfectly well until October, 1888, when, owing to some slight neglect, his eczema once more became exulcerated, the surface abundantly discharging a now greenish and then blue pus, while the temperature rose up to 38° C, and the frequency of the pulse up to 120 per minute.   In January, 1889, there supervened diarrhœa of several days' duration, the stools being either watery, or slimy and blood-stained.   In the beginning of February, there appeared a steadily extending anæsthesia of the lips, cheeks, legs, scrotum, penis, buttocks, anus, and later on of all the four extremities.   It was accompanied by a similarly gradually spreading paresis and wasting of the limb, as well as by cardiac weakness, constipation, loss of appetite, decrease in the daily quantity of urine, and slight albuminuria.   On a most careful examination (with all sterilizing precautions), the urine proved to contain the *bacillus pyocyaneus* in pure cultivation (which, on subcutaneous injection into a rabbit, caused a severe diarrhœa, ending in death in a few hours).   The treatment adopted by Dr. Jadkevitch on this occasion consisted in faridization and the internal administration or coffeine, etherinal tincture of valerian and camphor, the patient making a somewhat slow but complete recovery (about the end of April, 1889).   According to the author's theory, all the three obscure attacks were caused by the *bacillus pyocyaneus* (and its vital products) penetrating into the patient's organism from the crural ulcers, induced by or infected with the pathogenic microbe.

[Noteworthy cases of human cyanomycosis have been also recently published by Dr. Edward Ehlers in the *Hospitals-Tidende*, May 21, 1890, p. 516 (two cases in children); Neumann, in the *Jahrbuch f.*

Kinderheilkunde, 1890, p. 244; and Oeltinger, in *La Semaine Medicale,* No. 46, 1890.—*Reporter.*]—*Meditzinzkoie Obozrenie,* No. 23, 1890, p. 992.

VALERIUS IDELSON (Berne).

OPERATIVE SURGERY.

I. **A New Method for Resection of the Elbow-Joint.** By DR. C. ZATTI (Bologna, Italy). The author, after considering the advantages and disadvantages of the different methods (Erichsen's, Koenig's, etc.), describes his own new method, which is as follows: The inferior extremity of the humerus is sawed through obliquely so as to resemble the adjusting surface of the corner of a picture frame, and with its surface looking downward and forward. Then the superior articular extremities of the bones of the forearm are sawed through, also in an oblique manner, to form the other adjusting frame-like surface, the latter looking upward and forward.

The surfaces of the bones are now joined, the forearm being placed in a position of semi-pronation and semi-flexion, so that the forearm rests now at a right angle upon the arm. The particulars of the procedure are: The postero-longitudinal incision is made, followed by separation of the soft parts and the periosteum; the articular extremities are then exposed and dislocation produced, after the method of Langenbeck, the humerus being fixated by an assistant.

A line is drawn which unites the lowest point of the external condyle with the lowest point of the internal condyle. This horizontal line divides the posterior inferior articular surface of the trochlea in its median part.

After this line has been marked out, the saw is conducted through it, being held obliquely, so as to bring it out anteriorly at the inferior border of the coronoid cavity. Thus a surface is obtained which forms with the longitudinal axis of the humerus an acute angle of 45 degrees. If, however, the morbid process should involve more than the articular processes, the resection may be practiced more extensively, with the same facilities and equal results. As regards the bones of the

forearm, the saw is applied about 1½ cm. below the apex of the olec-
ranon, and carried through obliquely below the articular cartilages of
the glenoid and sigmoid cavities to come out at the base of the coro-
nid process of the head of the radius.   One obtains, thus, a surface,
which forms with the longitudinal axis of the forearm an acute angle of
45 degrees.   Through the above procedure two ample section-surfaces
result, which can be well adapted to each other and permit the forearm
to rest solidly upon the arm at a right angle.   In cases where the
junction of the two surfaces is not sufficiently secure, this may be as-
sisted by sutures which are to be introduced at the apex of the angle
to be formed.   It often happens that one of the surfaces overlaps the
other posteriorly.   In such cases the osseous projection must be re-
moved in order to avoid irritation of the soft parts, which may cause
gangrene.   It is, also, of importance to saw through the articular ex-
tremities, while an assistant is holding the forearm in a position of
semi-pronation, as this position is the most favorable as regards the
function of ankylosed forearm.

The author finally remarks that this method of resection of the el-
bow-joint perhaps has been used by other surgeons, here and there,
but as he has not found it stated in the textbooks, he thought it not in-
opportune to put it on record.—*Gazzetta Degli Ospitali*, XI, No.
105, p. 834, 1890.

A. PICK (Boston).

II. Total Resection of the Carpus by the Dorsal
Method; Metallic Suture of the Bones of the Metacarpus
with Those of the Forearm in the Treatment of the Fun-
gous Synovitis of the Carpus.   By DR R. GRITTI (Italy).   The
writer proposes a method of performing total resection of the carpus
in fungus of the carpal bones.   The technique of the operation is as
follows :

The hand is washed carefully and rendered aseptic, the patient an-
æsthetized and an elastic ligature applied above the elbow.   Two lat-
eral incisions are made on the dorsum of the hand, one on the radial
side, corresponding to the border of the second metacarpal bone, and

the other on the ulnar side. They should extend from two centi-
metres above the lower end of the radius and ulna to two centimeters
beyond the heads of the metacarpal bones. These two incisions are
then united by a central one running across the dorsum of the hand
and forming with two preceeding ones an H. This third incision sev-
ers the skin, the tendons of the second, third, fourth and fifth fingers
from the extensor communis digitorum, that of the extensor proprius
indicis, and extensor minimi digiti, and the nerves and veins of that
region. The extensor longus pollicis is not cut, the tendon being
drawn aside by means of a hook. The radial and ulna muscles are
cut and left to themselves. This done, the severed tendons are sepa-
rated into groups; firstly, the tendons of the extensor proprius indi-
cis; secondly, those of the extensor communis digitorum of the second,
third, fourth and fifth fingers, and thirdly, that of the extensor proprius
minimi digiti. Sutures are drawn through their ends in order that they
may later be reunited without mistake. The ends of the radius and
ulna are then sought for and sawed across slightly above the epiphy-
ses, the ṣaw being held a little more removed from the radius than
the ulna. This must be done with great caution, in order not to
wound the arteries and tissues beneath. The metacarpus is then cau-
tiously detached in one single mass, care being taken not to open the
sheath of the flexors or impinge upon the two radiopalmar arteries
and the two palmar arteries. The pisiform and the unciform bones
may be either enucleated or cut in two. On arriving at the trapezium
the knife should be kept well up against the carpus in order not to open
the articulation of the trapezium, with the first metacarpal, but be thrust
in between the trapezium and trapezoid bones. Then the thumb with the
carpometacarpal articulation remains undisturbed. Finally, the carpus is
cautiously detached from its attachments below as far as one centi-
metre above the carpo-metacarpal articulation; the heads of the sec-
ond, third, fourth and fifth metacarpal bones are sawed straight across
and the carpus removed in one piece. The attending hæmorrhage is
usually but slight, as the palmar vessels remain uninjured. The sur-
face of the wound is cleansed and, if any sinuses or articular fungosi-
ties be present, they are curetted. The surfaces of the resected bones

are then placed in contact and united by two metallic sutures, the ulna being joined to the fourth metacarpal and the radius to the second metacarpal bone. The ends of the tendons are then brought to gether and joined; firstly, the tendon of the -extensor indicis, then those of the extensor communis digitorum, and, finally, that of the extensor minimi digiti. The tendons are not joined by simply bringing their cut surfaces together but by over-lapping the ends by two centimetres. In this manner they are somewhat shortened, as the hand has lost some six centimeters in length. The wound is then closed, sutured and drained. After an antiseptic dressing has been applied the forearm is placed upon a well padded splint, while the hand is elevated by a cushion. The operation generally lasts an hour and does not present any especial difficulties. After the operation there is, as a rule, tactile insensibility of the dorsum of the hands and fingers. The writer then gives the details of three cases operated on, more or less successfully, by his method, and makes the following deductions:

1. The blood supply of the hand is not disturbed, as the arterial trunks running on the palmar surface of the hand are not cut.

2. The movements of extension of the fingers make their appearance generally about the tenth day. The movements of flexion are uninfluenced, although the hand is shortened about six centimetres.

3. The tactile sensibility, which is destroyed by the operative procedures, begins to be restored even before movements of the fingers are possible. It first appears in the cutis of the fingers and progresses up the hand.

In one case it appeared ten days after the operation.

4. Bony ankylosis probably does not take place, but rather is a pseudo arthrosis formed, which is more to be desired as the freedom of movement of the hand is thereby greater than if an osseous fusion with immobilization would take place.

In the first two cases operated on, there resulted an abduction of the hand, due to sawing the lower ends of the radius and ulnar straight across. Hence, the writer recommends holding the saw somewhat obliquely, in order to remove more from the head of the radius than from the ulna.—*Gazzetta degli Ospitali*, No. 12, 1891.

F. H. PRITCHARD (Boston).

III. The Use of Plates Made of Raw Potato in Intestinal Anastomosis. By R. H. M. DAWBARN, M.D. (New York). The author, as the result of many experiments on dogs, is satisfied that plates cut from raw potato are the best aids to intestinal anastomosis, whether for emergency work or for that performed after deliberation. For use in the human gut the plates should be made about one-third of an inch in thickness, possibly a trifle thicker. To prevent the thread from cutting through, it should be very coarse, should have a large knot, and before passing it through the plate, the thread should be passed through a bit of rubber or cloth. The plates should be so long that the opening shall be about twice the normal diameter of the gut to be operated upon, for ultimate contraction of the new hole to even half its original size is to be expected. Such a raw potato plate is very rigid, and retains its rigidity considerably longer than any of the catgut ones. It should not be immersed in a carbolic solution before use as this tends to make it soften more quickly. The peeled potato is improved by being soaked in water for an hour or two before being used, as it is somewhat hardened by the process.

The author describes certain modifications in the technique of intestinal anastomosis. He leaves open the two ends of the intestine between which the anastomosis is to be made until after the plates have been introduced, their anchor-stitches passed and tied so as to secure the desired apposition of the intestinal walls by the approximation of the plates. He then further secures the intestines together by two rows of stitches passed around the periphery of the plates, the first introduced so as to cover in the anchor stitches, and the second so as to cover in equally the first row. For these lines of suture he used a continuous basting stitch, the needle being passed longitudinally, making about three stitches to the inch. The attachment of the two lower walls to each other having been thus fully secured, then and not till then he makes the anastomotic opening. To do this he inserts a thin plate of wood into the open end of one bowel so that it shall be applied over the opening in the plate, and then with a knife introduced through the open end of the other bowel, he incises the two apposed bowel walls as freely as the opening in the plates will allow by cutting

through upon the wood, which guards against damage from the point of the knife.   The adequacy of the suturing should now be tested hydrostatically, and if all is satisfactory, the open ends of the anastomized bowel are closed by inverting them and suturing.   He also recommends for the purpose of hastening and increasing the amount of plastic exudation that the peritoneal surfaces that are to be brought into contact should be well scraped with a scalpel before any sutures are tied.—*Med. Record*, 1891, June 27, p. 725.

ANNALS

OF

SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

EDITED BY

L. S. PILCHER, A.M., M.D.,   AND   C. B. KEETLEY, F.R.C.S.,

OF BROOKLYN, N. Y.   OF LONDON, ENG.

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